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# PUBLIC WORKS.

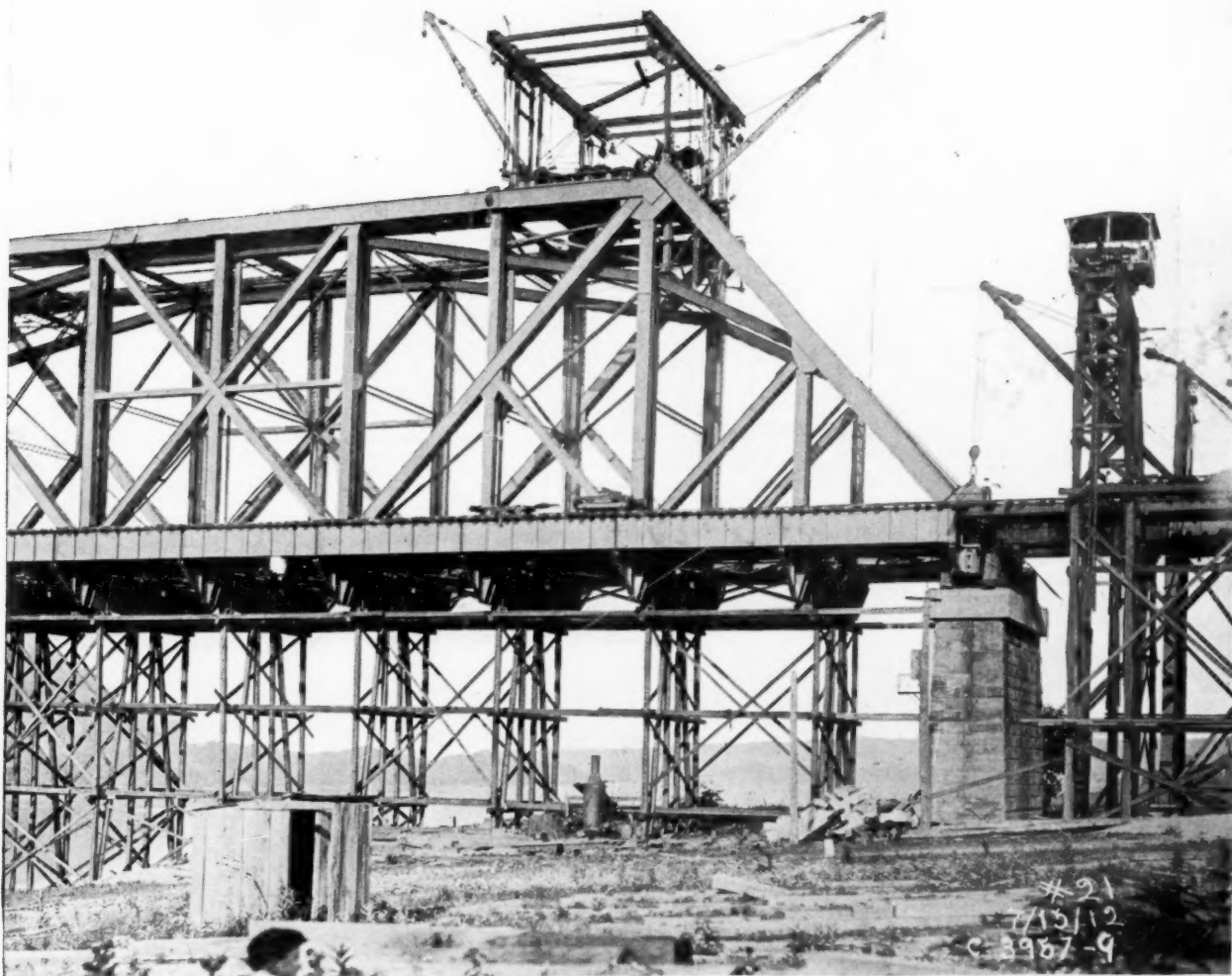
CITY

COUNTY

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A COMBINATION OF

"MUNICIPAL JOURNAL & PUBLIC WORKS" and "CONTRACTING"



ERECTING END SPAN OF THE KENOVA BRIDGE.

Small traveler and derrick car erecting 54-ton end post delivered from low level by hoisting tower at right. New trusses completed outside of old trusses.

NEW YORK, APRIL 24, 1920

## PUBLIC WORKS



### "Not one cent for maintenance" - *Says President of Massachusetts Highway Association*

In a letter to one of our representatives, Mr. W. J. Gannon, an authority on highway engineering, who is Superintendent of Streets at Fitchburg, Mass., and President of the Massachusetts Highway Commission, writes:

"In regard to *asphalt*, would say I have been using it entirely for the last five years, and up to the present time our roads have *not cost us one cent for maintenance*. Many of these are our heaviest travelled streets."

County and state highways can also

be made traffic-proof and weather-proof by giving them *asphalt* surfaces. The cost is not prohibitive. Judged on a cost per year basis *asphalt* roads are the most profitable investment for highway funds.

For the information of engineers, contractors and public officials responsible for the building and maintenance of streets and highways, our engineering department has recently compiled monographs on several important phases of highway economics and engineering. They will be sent free of any cost or obligation.

*Write for Brochures Nos. One to Eight.*

#### THE ASPHALT ASSOCIATION

25 West 43rd Street, New York

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# PUBLIC WORKS.

CITY

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A Combination of "MUNICIPAL JOURNAL AND PUBLIC WORKS" and "CONTRACTING"

Vol. 48

NEW YORK, APRIL 24, 1920

No. 15

## Refuse Disposal in Savannah

**All refuse is collected, unseparated, by wagons and carts and burned in a destructor. This creates steam, which operates the plant and, used by the water works pumping plant, saves it \$10,000 to \$12,000 a year in coal. The destructor, six years old, received its first repairs last year.**

The refuse of Savannah, Ga., is burned in a destructor. This applies to all the refuse—garbage, rubbish and ashes—except iron and other metals, plaster and other non-combustible rubbish which, with a small amount of paper and other combustible matters, are dumped on swampy land east of the destructor.

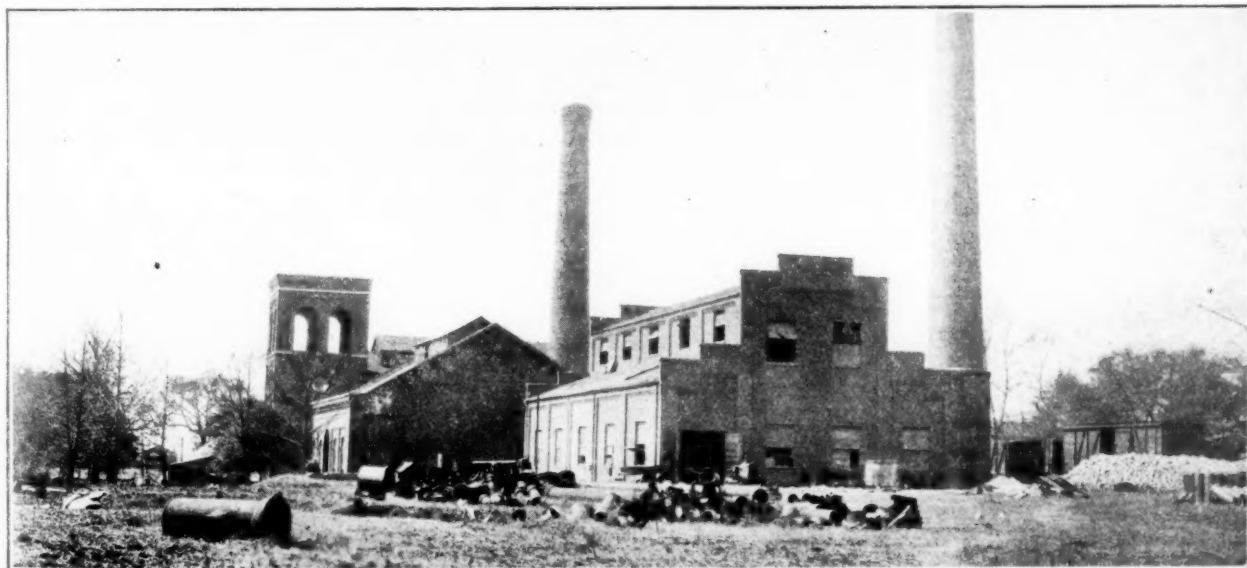
### COLLECTION.

The refuse is collected by means of 37 wagons each drawn by two mules, and 8 carts each drawn by one mule. Mules and wagons and carts are owned by the city, and are kept in a municipal stable not far from the destructor plant. Some of these collect two loads a day and some three loads. Collections are made daily from practically all buildings. The destructor lies at one edge of

the city, near the railroads, and is about  $1\frac{1}{2}$  miles from the business center and 4 miles from the most distant point of the city.

All the refuse is collected together and no record is possible of the relative amounts of each; but the superintendent of this utility and of the water works, Lewis A. East, estimates that about one-seventh of the total is ashes. As each wagon or cart reaches the plant it is weighed, and an accurate record is thus kept of the amount collected and disposed of. This is an average of about 70 tons a day. During the year 1919 the total was 22,885.25 tons. The monthly totals ranged from 1,644 to 1,896 tons, except during July and August, when watermelon rinds caused an increase to 2,734 and 2,298 tons, respectively.

In general, about 3 minutes is required to weigh



DESTRUCTOR (IN THE FOREGROUND) AND WATER WORKS PUMPING STATION (IN THE BACKGROUND) AT SAVANNAH.



a load, dump it into the destructor pit and leave the grounds; but when several loads arrive at once, the last may be on the grounds 15 or 20 minutes. Wagons and carts are rear-dump. More or less use of fork or shovel is required to get all of the refuse out of them into the pit. One man is kept in the pit all day to work the refuse back from the dumping point and help unload.

The city expects to put into use soon two 3-ton trucks as tractors, using the present wagons and carts as trailers, these to be replaced by regular trailers as they wear out. Collection will be made by these trailers hauled by mules, which will be left in alleys at their intersection with a designated street, from which points they will be collected by the tractor-trucks and hauled, in trains of four or five, to the destructor. There will also be a 1½-ton truck for removing dead horses and for general service.

#### THE DESTRUCTOR.

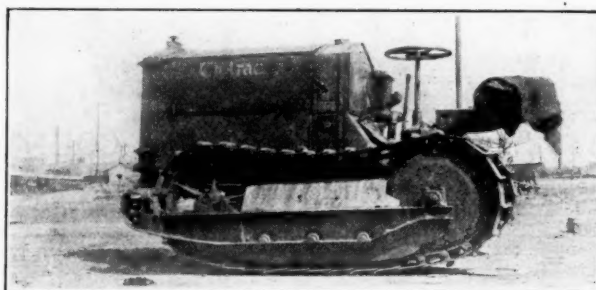
The destructor is of the Heenan type, completed by The Destructor Company in 1914. It consists of two 4-cell units, operated by forced draught. (This plant was described by *Municipal Journal* in the issue of February 11, 1915. We are informed that this make of plant is no longer being installed in this country.) The heat is utilized to raise steam and superheat it, a Foster superheater being used. Part of this steam is utilized for operating a Westinghouse direct-current generator, the current being used for lighting the plant and operating the various parts of it. Most of the steam, however, is used by the water works pumping plant, which is only a few feet distant. It cost \$33,852 to operate the destructor during the year 1919, and the steam furnished to the water works plant saved \$10,000 to \$12,000 in coal.

Only one unit of the destructor is operated during Monday, Tuesday and Wednesday, but both are used during the remaining three days, or so much of them as may be necessary to clean out the refuse storage pit by Sunday. (The guaranteed capacity of each unit was 390 tons in six days, while the refuse delivered averages 490 tons and exceeds this part of the time.) When both are operating, they furnish almost all the steam needed for pumping.

During the first half of the week the unit not in use is cleaned out. This cleaning includes removing the ashes from the combustion chamber and the clinker from the grates. The clinker is



DUMPING GROUND NEAR INCINERATOR.  
Large lumps of clinker are shown at the top of the pile.



TRACTOR USED FOR HAULING CLINKER CARS.

drawn out by power onto steel dump cars, which, since last May, have been taken to the dumping grounds, two or three hundred feet away, by caterpillar tractors furnished by the Cleveland Tractor Company, of which there are three. Formerly, mules were used for this service, at greater cost. Most of the clinker is dumped, but some has been used as base for street surfaces. The cost of clinker disposal in 1919 was \$1,653.

No fuel is used in the furnaces other than rubbish, the more combustible of which is used for starting fires after a shut-down. No supplies (other than for repairs) are purchased except oil and occasional replacement of minor tools.

Twenty-three men are employed at the plant, one in the pit, one weighing the loads, and, on each of three shifts, an engineer, craneman, three firemen and two laborers.

Three years ago the grate bars were replaced, and should now be renewed again. Aside from this, the first repairs to the plant were made last year, when the lining of the combustion chamber was renewed, repairs made to the hoppers, and some others, at a total cost of about \$5,000.

## Reservoir Maintenance in Hartford

**High color was found to be due to swamps and to weeds growing along the reservoir shores, and was eliminated. Reservoir gangs were kept busy on the water-shed winter and summer.**

In the 1919 report of Caleb Mills Saville, manager and chief engineer of the Hartford Water Department, the following comments upon the water supply of that city are found:

Some rather high colors are found in the various waters supplying Hartford. Of the present reservoirs, Nos. 1 and 4 are the highest and Nos. 2 and 6 the lowest. These are all old reservoirs and their condition is so stabilized that little or no changes from year to year may be expected under ordinary conditions. Such matters are attended to by cutting of weeds on the shores when the water is low, by planting coniferous trees along the reservoir shores to act as a screen to prevent leaves of other trees from getting into the water, and by some swamp drainage. The average color in the Nepaug reservoir is considerably lower than for the past two years, as was anticipated. The reduction of color here has followed to a very remarkable extent the predictions made by F.



P. Stearns, consulting engineer, two years ago, and the results are such as to warrant belief that the expectation of a future color of this water comparable with the best that Hartford now has will not be disappointed. While the natural influences are at work to bring about this result, this time can be hastened and possibly even better results obtained by swamp drainage in the area tributary to Phelps brook, which the board plans to undertake. The swamp area here is comparatively small and mostly on land now owned by the board. From this area, however, comes most of the color produced outside the reservoir proper. Other causes producing color in the reservoir will be gradually eliminated by natural agencies. Those in the water shed, however, will be perpetuated unless the action above referred to is taken. The results obtained elsewhere make it certain that the improvements stated above are of great value and it is intended to undertake them from year to year with the forces of the board.

The interesting feature of this is the recognition that, although there is only a small amount of swamp area on the water-shed, most of the color comes from this; and that formation of color in the reservoir itself may be largely prevented by cutting weeds on the shore when the water is low and by planting coniferous trees along the shores of the reservoir.

During the same year two small maintenance gangs, each averaging about three men with a foreman in charge, were employed continuously at the Nepaug reservoir, one at each of the two dams. Each of these kept in repair a road crossing the reservoir site, cleaning out the gutters and catch-basins and building fences as required. They also kept the brush, weeds and grass cut along the shore line of the reservoir and for a distance of 25 feet back from the water.

They also cut out diseased chestnut trees and carried on reforestation work by planting 35,000 small pine trees. One gang made an inspection of all of the brooks in the upper portion of the water-shed to ascertain the source of high color in certain of them. This gang also cut 33 tons of hay, 15 telephone poles, 217 ties, 7,000 feet of lumber and 62 cords of wood. The other gang planted four acres of land to buckwheat and harvested the crop of 35 bushels in the fall; cut 75 cords of wood and 79 railroad ties. The two gangs combined cleaned the filter plant in September, removing, washing, regrading and replacing all the sand and gravel.

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## Kenova Bridge End Span Erection

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**Two single-track, 298-foot spans, 100 feet above water level, replaced by double-track spans on the same substructure without interrupting traffic. Old stringers supported on falsework that carried the traffic and the new span erected on its suspended floorbeams. Tops of old piers rebuilt, new span lowered to permanent support on them, old trusses and subsequently old floor and falsework removed by travelers supported on new span.**

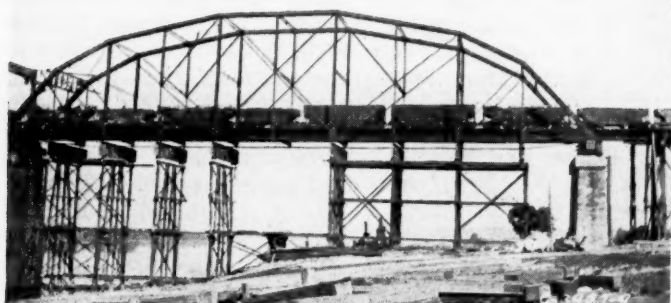
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The Norfolk & Western Railway Company's single-track bridge across the Ohio River at Kenova, West Virginia, included a five span structure 1,800 feet long and 100 feet above water level which was replaced by a double-track structure of the same grade and alignment without interrupting railway traffic or river navigation. The two duplicate 298-foot end spans were replaced by a falsework method containing some unusual features that eliminated most of the danger to both old and new structures that might be occasioned by floods washing out the falsework, and which is described in the present article. A reconstruction of the adjacent intermediate spans was described in PUBLIC WORKS, March 27, page 237, and the unusual method adopted for the rebuilding of the 518-foot centre span will be illustrated in a future article in PUBLIC WORKS. All of these operations, although applied to a railway structure are equally suitable for the renewal of a highway bridge and as the same or similar problems involving traffic and navigation, protection from floods and utilization of substructure are likely to occur in the latter type

of structures, the methods and operations employed for the railroad bridge are of interest and value for the solution of reconstruction problems for state, municipal, or county bridges that are often in charge of officials to whom the services of the highly specialized staff that handled this railroad bridge are not easily available.

At the time of reconstruction, the Kenova Bridge was subjected to a traffic consisting principally of coal trains of 50 to 75 cars each, passing about every 20 minutes, day and night. The height of the bridge piers and the possibility of a flood in the river that might endanger the falsework, together with the fact that the existing piers were not long enough to receive the wide new structure, added considerably to the difficulties and expense of the work. Although it was forbidden to use falsework in the river channel, its use was permissible on both sides of the river where the ground was partly or wholly above water level according to the stage of the river.

After the replacement of the 2,148-foot single-track plate girder viaduct approach at one end of



FALSEWORK BENTS PARTLY ERECTED AND NEW FLOOR-BEAMS SUSPENDED UNDER OLD 298-FOOT SPAN.

the bridge by a double-track structure the tops of the tall masonry piers for the main spans were cut down and long plate girders transverse to the bridge axis were installed on them to support the wider new spans, an operation which was executed by ingenious and skillful operations that did not interfere with traffic. After the pier girders were in place, three-story framed timber falsework bents on pile foundations were installed under the end spans and the support of the old track stringers was transferred to them, relieving the old spans of live loads. The old spans were then competent to carry the new spans during erection, thus avoiding any danger that might be threatened to either old or new spans by the destruction of the falsework.

#### FALSEWORK.

Nine falsework bents about 30 feet apart, were erected under the panel point of the old trusses and were braced longitudinally with two double lines of 10 x 12-inch timbers and in alternate panels with 4 x 8-inch X-braces. Clearance was left between the upper caps and the bottoms of the old floorbeams and on each side of the bridge axis there were placed on the caps a double line of 15-inch 42-pound I-beams to support the old bridge floor. The new floorbeams, extended by a detachable cantilever bracket at each end to carry the temporary service tracks, were inserted between the top of the falsework and the bottom chords and floorbeams of the old span, and each was temporarily blocked up on the falsework. Pony bents were then erected each side of the new floorbeams on the longitudinal 15-inch I-beams and the old stringers wedged to bearing on them and detached from the old floorbeams, thus transferring the support of the traffic to the falsework.

The trusses thus being relieved of live loads and impact were competent to carry an equivalent additional dead load and the new floorbeams were accordingly suspended from the old floorbeams by a pair of 3-inch vertical screw rods at each end, carefully adjusted to give the computed number to the trusses. Pairs of 15-inch longitudinal I-beams were supported at panel points over the two horizontal middle panels of top chord of the old trusses, on them was laid a

track, and a two-boom platform traveler was installed there with which pony bents of falsework, carrying in the plane of each truss a pair of 20-inch longitudinal I-beams, were built and supported at the panel points of the inclined top chords from the center to the end of the old span, thus providing for the movement of the overhead erection traveler from end to end of the span.

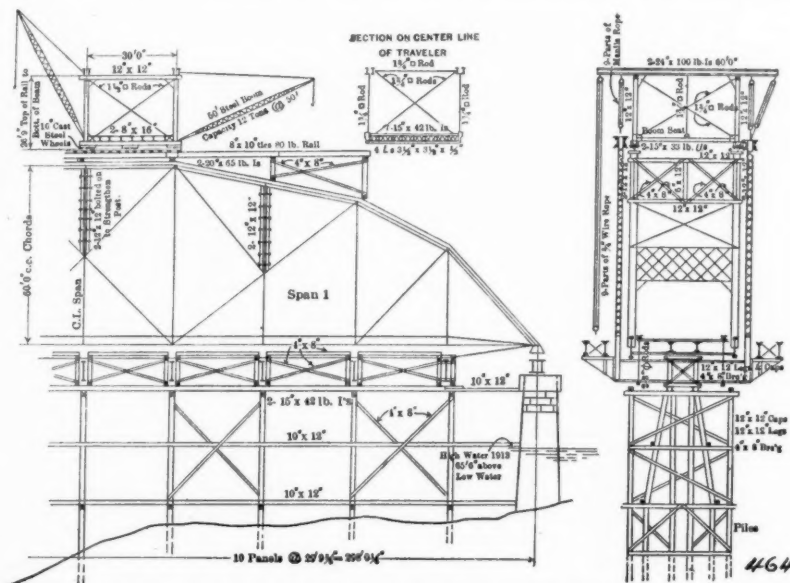
#### ERECTION TRAVELER.

The platform traveler had a 30 x 34-foot frame, supported on four wheels with a tower about 27 feet high over all with four vertical posts, between which were the two front and rear 50-foot steel derrick booms of 12 tons capacity. The tops of the vertical posts were connected by pairs of 24-inch 100-pound transverse I-beams 60 feet long that cantilevered 13 feet beyond the centers of the old trusses providing abundant overhang for tackles concentric with the service tracks and the new trusses by which the material for the new span was unloaded and erected. This traveler was erected by a 6-ton jinnywink and was equipped with a four-drum, eight-spool, 100-h. p. electric hoisting engine.

The traveler erected stringers on the cantilever projections at both ends of the new floorbeams on which a service track was installed enabling the material for the new trusses to be delivered to the traveler without interfering with traffic on the main line through the old spans. The bottom chords were unloaded from the service track by wire rope tackles, and flected to position by manila rope tackles after which the web members of the trusses were delivered and erected, the new floorbeams being wedged to bearing on the outer posts of the falsework to avoid imposing too much additional load on the old span trusses.

The 54-ton end posts of the span were erected by the traveler lifting one end and by a derrick car on the main line.

After the new top chords were erected, the traveler removed the falsework over the inclined panels of top chords, simultaneously erecting the



FALSEWORK AND TRAVELER FOR ERECTION OF NEW DOUBLE-TRACK TRUSSES OUTSIDE OF OLD SINGLE-TRACK TRUSSES.

new portals and part of the top lateral and sway brace system, and retreating to a position over the center panels of the old truss where the track was not removed.

Jacking girders were then attached to the bottom of each of the end posts and two 500-ton hydraulic jacks were operated at each post to lift the new span 5 inches, permitting the rods that suspended it from the old floorbeams to be disconnected after which the jacks were slackened off, lowering the span to permanent bearing on the pier girders.

A traveler track was laid on the horizontal top chords of the new span, the traveler was jacked up and extensions placed under it to enable it to run on the broader gage new track. The traveler then assembled on the new track the 43 x 30-foot platform of a new 423,000-pound traveler and erected on it a steel derrick with a 65-foot boom of 12 tons capacity that completed the erection of the new traveler and was subsequently removed by the old traveler.

The new traveler, illustrated on page 238 of the previous article, was equipped with two 75-foot steel booms with a maximum capacity of 60 tons each, and the electric hoisting engine was transferred from the old traveler and replaced there by a two-drum, four-spool steam hoisting engine.

#### REMOVAL OF FALSEWORK AND OLD SPAN.

The pony bents that supported the traffic during the erection of the new span having been removed, the 15-inch longitudinal I-beams that carried them were also removed and placed on top of the new floorbeams to support the old span which was wedged to bearing on them. The old trusses and bracing and the old falsework were removed by both travelers moving on the top chord track of the new span. The old floor system was not removed at the same time but was allowed to remain blocked up on the I-beams until the completion of all the new spans. The cantilever extensions of the floor beams were also left temporarily in position to carry the service track that was used for the erection of the center and intermediate spans. The small traveler also remained available for use until after the completion of the channel span which together with the intermediate spans were erected by the large traveler above mentioned.

The bridge was designed, fabricated and erected by the American Bridge Company, C. W. Bryan, chief engineer, C. G. E. Larsson, assistant chief engineer, who devised the general construction method, W. G. Grove and Henry Taylor, assistant engineers. The diagrams illustrating this article are reprinted from a paper by W. C. Grove and Henry Taylor, published in the Transactions of the American Society of Civil Engineers, Volume 79, page 411.

An important canal project is for the connection of Lake Erie and the Ohio River by 101 miles of a canal 12 feet deep, 140 feet wide at the bottom and 188 feet wide at water level, with a total lockage of 559 feet, that will have, if built as a single-lock structure, a capacity of 38,000,000 tons and will effect a net saving of 50c per ton of material carried through it.

## Bridge Numbering in Kansas

The county engineer of Republic county, Kansas, E. A. D. Parker, sends us a description of the method of numbering highway bridges which is employed in his county, in order that it may be compared with that of Mercer county, N. J., described in our issue of February 14.

The method employed in Kansas, while it would probably serve equally well for many of the other states in that section of the country, could not conveniently be applied in the eastern states, for the reason that in the central states practically all of the roads are laid out on section lines, running due north and south or east and west, while in the eastern states the location of roads is determined by the topography and directness of travel to a very large degree, and probably in no cases do they follow artificial lines such as the boundaries between townships, etc.

Mr. Parker sends a blueprint of Republic county, on which are shown all of the section lines, streams, railroads, and highways, the section numbers also being given. On the back of each voucher relating to a bridge or culvert is printed the following notice:

#### The Numbering of Bridges and Culverts.

Spans of 10 feet or less are Culverts; spans over 10 feet are Bridges. C before the figures indicates a Culvert, B a Bridge. These letters are always to be placed before the figures. The first figure is the Township number, the next the Range number, the third, or third and fourth figures are the Section number, the last figure is the number of the bridge or culvert on the section line, counting from the northeast or southeast corner of the section, and the letter following the figures shows whether it is on the east or south line of the section. This shows exactly where the Bridge or Culvert is in the county. On the north or west line of the COUNTY the letters N and W would be used, and the count be made from the northeast and northwest corners of the section.

As an illustration, B 23361 S indicates a bridge in Township 2, Range 3, on the south line of Section 36, being the first bridge on that line from the southeast corner of the section.

## Wayne County Secures Its Own Gravel

PUBLIC WORKS has for the past two or three years advocated the securing of gravel pits, quarries, etc., by county and state highway departments, as well as by city paving departments, both in order to have the material under better control as to both quantity and quality, and also to develop throughout various counties and states as many local supplies as possible to cut down the delay, cost and other inconveniences caused by transportation.

Wayne county, Michigan, last year leased a gravel bed in Northville, and developed its own supply for concrete roads in the vicinity. The lease was secured on a basis of 15c. per cubic yard of material in the bank, payment to be made on the basis of the number of cubic yards of concrete pavement laid. A washing plant was erected having a capacity of 200 cubic yards a day, the approach to the gravel bed was graded and an industrial railway led to the chutes of the washing plant bins. The layout of the deposit was such that it was cheaper to ar-



range a yard at the bed than it would have been to unload from railway cars; in addition to which, the haul was less by about a half-mile than it would have been from the nearest railroad siding.

A small stream flowing from local springs furnished an abundant supply of water, which was pumped 1,000 feet through two lines of 3-inch pipe by electric motor. A single line of 4-inch pipe would have sufficed, but 3-inch pipe was used because it was in stock. The daily cost of operation totals \$76—comprising \$32 for 4 teams, \$10 for 2 scrapers, \$6.50 for a foreman, \$6 for an operator, \$10 for two car loaders, \$1.50 for motor rental and \$10 for electric current.

Last year the average daily output was 200 cubic yards, giving a cost of 53c. per cubic yard loaded in industrial cars ready to haul. In the above cost, the largest item was that of 4 teams, which were used to load the hopper which feeds the belt. This could have been eliminated by installing a drag-line bucket and hoisting engine, but because of the short run which this plant would have, it was not considered advisable to increase the investment to that extent.

Commercial gravel cost \$1.50 per ton or \$2.25 per cubic yard unloaded into industrial cars, if brought in by rail, from which it appears that the plant saved the county about \$1.72 per cubic yard of the material produced. It is expected that there will ultimately be used approximately 10,000 cubic yards of material from this bed, which will show a gross saving of \$17,200. The plant cost about \$7,200 to erect.

This year it is expected to operate the plant a few months to supply gravel for maintaining 24 miles of gravel road, the maintenance of which requires from 3,000 to 4,000 cubic yards of gravel per year. Coarse sand taken from the plant will also be used for maintaining crack and joints in a large mileage of concrete roads.

### Viaduct to Reach Pumping Station

The pumping station and filtration plant of the Evansville, Ind., municipal water works are located on a small island, which is connected with the main land by a road which, although it has been raised from time to time, is covered during flood stages of the river, cutting off the water works plant from the main land.

The embankment which forms the road is also utilized for covering the two 30-inch force mains leading from the pumping station to the city. The successive raising of the road has resulted in burying these mains under about 16 feet of earth, and it is not thought advisable to bury them any deeper by raising the road any higher. Moreover, it is considered certain that, should one of the force mains break, the other would be damaged by the washing out of the embankment before the pumps could be shut down and the valves closed between the break and the city distribution system.

It is therefore the intention of the city, we are informed by the general superintendent of the water works, Charles Streithof, to build a viaduct which will furnish a means of access to the island which will be above the highest water and will also

carry a 42-inch force main, which can not be affected by a break in the other two. This viaduct will accommodate motor trucks to be used in hauling coal and chemicals to the plant, and will render unnecessary the motor boats which are now used to carry the employes to and from the plant during high water. This viaduct will be about 2,200 feet long.

### Rotary Snowplow for Cleaning Sidewalks

The heavy snowfall of the winter of 1919-20 has called into service in Canada a new type of power-operated rotary snowplow that eats its way through the drifts by producing a miniature blizzard. Four-bladed cutters driven at a speed of 500 revolutions per minute whirl the snow up through the deflecting hoods. The operator can adjust these hoods so as to throw the snow a short distance from the machine, as is desirable in city streets, or 30 to 40 feet from the cut, as on suburban roads.



ROTARY SNOW PLOW, DRIVEN BY GASOLINE ENGINE AND DRAWN BY HORSES.



SHOWING WIDE SPREAD OF SNOW BY ROTARY PLOW.

Four or six horses are used, but the snowplow can also be attached to a tractor or truck. The draft is not heavy. The forward sled will go through a 3-foot drift without trouble, and the rear sled travels in the broken path that has been cleared. The height of the cutters can be adjusted so as to leave a bed of snow several inches deep for sleigh traffic. One big advantage in the use of the machine is that the snow is evenly distributed, and thus big banks are not formed, as is the case where the walks or roadways are cleared with shovels.

# Kalispell Water Works

**This municipal plant uses electrically operated pumps, with a steam turbine as an auxiliary. By installing the latter, a saving of \$15,000 in insurance premiums was made to the citizens. The finances of the department are shown by the latest annual statement to be in excellent condition.**

The city of Kalispell, Montana, has been operating its water works as a municipally owned utility for six years, and apparently has developed an excellent system. In September, 1913, the voters decided by a ratio of more than three to one to purchase the water system which had previously been operated by the Northern Idaho and Montana Power Company, issuing bonds to the amount of \$175,000 to be used for this purpose and for improving the plant. Of this amount, \$142,500 was paid for the plant and \$2,827 for expenses, leaving \$29,673 for improvements. Since that time up to December 31, 1919, the department has used this amount for improvements and also \$36,144 derived from the operating accounts of the department.

The improvements include a new pumping plant and the land and buildings for installing it, the plant consisting of electrically operated centrifugal pumps, in duplicate, together with a new reservoir and pipe line, and \$4,265 expended in building retaining walls, grading and otherwise improving the grounds around the new station.

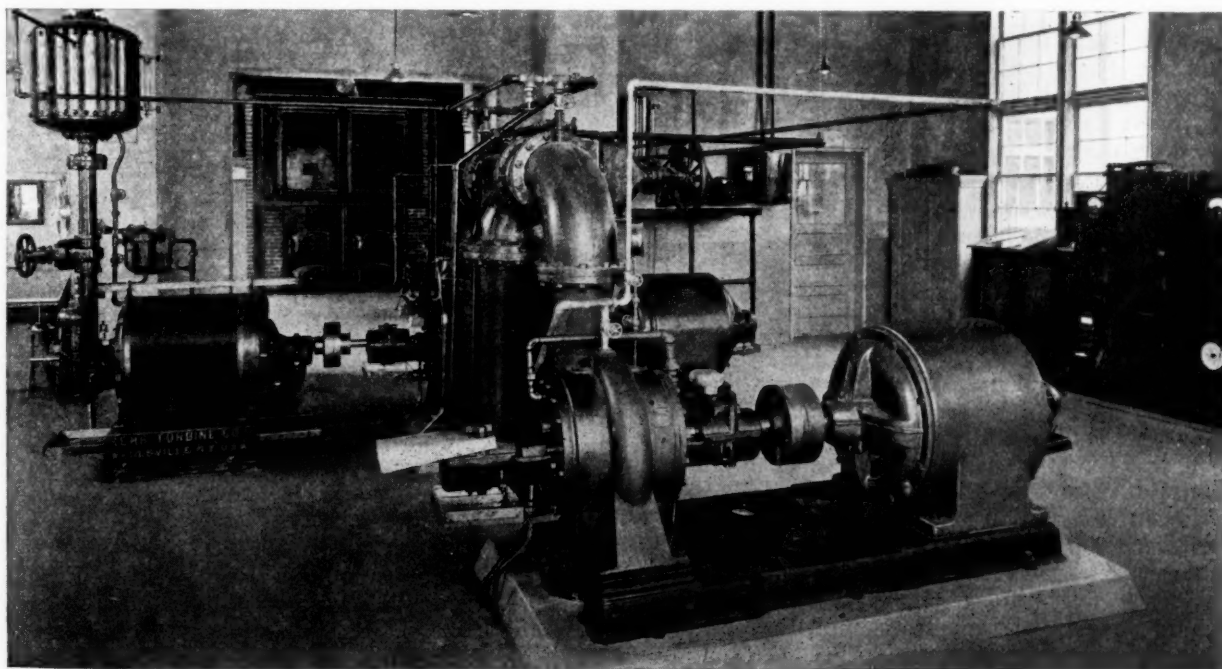
The new electric pumping plant was completed and went into operation during May, 1916. When constructing the new plant, Mayor Pauline obtained from the insurance companies a reduction of about 33 per cent in the insurance rates charged in that city (equivalent to \$15,000 annual saving in premi-

ums), the understanding being that the city would provide a steam auxiliary pumping equipment which would be equal to one of the electric units. To comply with this the city also installed a steam plant consisting of a 225 horse-power Geary water tube boiler and a Kerr Turbine Company steam turbine connected by flexible coupling to the extended shaft of one of the centrifugal pumps. (The illustration herewith shows the electric pumps and the steam turbine so connected to one of them.) The electric pumping equipment cost \$6,802, and the steam pumping equipment \$8,276.

The electrical equipment is used for all pumping, and the electric service has been so practically uninterrupted that no use has yet been made of the steam plant for pumping water. As the cost of the steam pumping equipment, however, was only a little over half of the annual saving in insurance rates secured by installing it, while the cost of maintaining the pumping equipment and building was only \$534 in 1919 and \$566 in 1918, the investment in the steam auxiliary was decidedly a paying one.

#### FINANCES.

The department superintendent, W. H. Lawrence, in his annual report for 1919, gives the cost of the plant at the close of the year as \$201,986. The assets of the department include, in addition to this,



**KALISPELL PUMPING PLANT.**

Steam turbine is shown connected to the shaft of the further centrifugal.

an investment in Liberty Bonds and certificates of deposit of \$82,829, and cash and accounts receivable of \$30,422. Deducting liabilities, there remains a surplus of \$42,299, plus \$289 worth of miscellaneous supplies.

The department derives no revenue from the city for hydrant rental or other public uses. During the first thirteen months of operation the revenue was \$47,188, which was reduced to \$32,736 in 1916, and has been gradually increasing to \$36,304 in 1919. The net earnings, after deducting depreciation and other fixed charges, were \$14,035 the first thirteen months, gradually falling to \$2,834 in 1917, and again increasing to \$8,282 in 1919. From the investment of its surplus the department received last year interest to the amount of about \$4,500.

#### THE SUPPLY.

The source of supply is a large spring located one mile north of the city and about 600 feet from Stillwater river. Following an investigation made by the State Department of Health in 1917, the secretary of the department reported that "A physical inspection of the spring and its surroundings shows that there are apparently no constant sources of contamination in the immediate vicinity of the spring that could affect the water. The spring itself is properly protected by a concrete structure which is adequate to protect the spring from pollution by surface drainage and infiltration. The water is pumped from the spring to a reservoir located on an elevation  $\frac{3}{4}$  of a mile north of the city. This is a concrete structure with a capacity of 1,800,000 gallons. The surroundings of the storage reservoir are satisfactory from the sanitary aspect. There are no sources of contamination anywhere near the reservoir. The reservoir is protected by a high wire fence. The reservoir is periodically cleaned and flushed. Water is distributed from the reservoir to the city mains by gravity."

Examinations of the water were made at that time and at intervals since then. An examination by the State Board on three separate occasions during 1919 gave negative results for B-coli in every case, and bacterial counts at 37 degrees C., 24 hours, varying from two to a maximum of twelve. Like all spring waters in that section of the country, this contains considerable mineral matter, the total solids being 226, and the total hardness 138 parts per million. Of the minerals, 180 parts were found as bicarbonate radicle, 48 as chlorine, 42 as calcium, and much smaller quantities of magnesium, silica, sodium and potassium.

#### A HOUSEHOLD WATER SOFTENER.

Commenting upon the mineral content, the Health Board said: "From the standpoint of mineral content, the Kalispell city water supply is an excellent one for all domestic purposes when compared with the average surface water supplies of Montana. A good household water softener for waters of sufficient hardness to be noticeable is trisodium phosphate. One teaspoon of trisodium phosphate added to five gallons of the Kalispell city water would soften the same satisfactorily for laundry and dish-washing purposes. This chemical would also be satisfactory to soften bath water if an excess is not used. The solid trisodium phosphate

should not come in contact with linen goods in the laundry. If trisodium phosphate is dissolved in the water before the clothes are added, there will be no injury to the linen, providing an excess is not used. For dish washing it will be satisfactory to add the solid chemical direct to the dish water. Water softened with trisodium phosphate should not be used for drinking."

#### PUMPING.

The total amount of water pumped during 1919 was 461,136,800 gallons. This gives an average daily pumpage of 1,264,000, the maximum amount for any one day being 2,433,000 and the minimum amount for one day being 609,000—about 200 per cent and 50 per cent, respectively, of the daily average. This gives an average of 210 gallons per day to each inhabitant. About 22 per cent of the total amount pumped passed through meters.

The amount of gallons pumped per k.w.h. last year varied from a maximum of 1,137 in December to a minimum of 984 in June, averaging 1,087 for the year. This is slightly less than the average for 1917, which was 1,115 gallons per k.w.h., but is much better than in 1915, before the new plant was put into operation, when the average was 629 gallons per k.w.h., the maximum for any one month being 661.

The cost of power last year was \$4,156. The expenses of operating the electric power plant during 1919 comprised \$3,601 for operating labor, \$4,156 for electric current and \$502 for supplies and other expenses; giving a total of \$8,259 for operation. Nothing was spent during the year for maintenance of equipment or buildings. For the steam power plant, nothing was spent for operating labor, \$524 was spent for miscellaneous labor and \$10 for supplies, a total of \$534.

Although nothing is charged for maintenance of the buildings or equipment, quite extensive improvements were made during the year to the grounds adjacent to the station. The ground was graded for lawn and shrubbery, improving the road to the station, etc. Mr. Lawrence says: "Our aim has been to make the surroundings attractive and kept in as sanitary condition as possible."

#### DISTRIBUTION SYSTEM.

The distribution system consists of about 20.54 miles of water mains, with 165 gate valves and 226 fire hydrants. The pipe in the distribution system is some of it cast iron, some wood, some kalamein and some spiral riveted. All of the four-inch spiral riveted which had been laid has been removed, and of the 4,569 feet of six-inch, 2,408 feet have been removed. There are 472 feet of six-inch cast iron, 1,830 feet of 8-inch, 2,904 of 12-inch, and 142 feet of 18-inch. No cast iron pipe once laid has been removed. There are in service 36,005 feet of 6-inch wood pipe and 945 feet of 8-inch, 3,444 feet of 13-inch, 5,369 feet of 16-inch and 4,350 feet of 18-inch wood pipe. The only wood pipe which has been removed since being laid was 3,050 feet of 16-inch and 366 feet of 6-inch. Of kalamein pipe, there are in service 2,264 feet of 4-inch, 44,229 feet of 6-inch, 1,823 feet of 10-inch and 2,509 feet of 12-inch; 11,661 feet of different sizes having been removed.



During 1919 the street gang repaired 113 leaks, of which 76 were in wood pipe, 31 in kalamein and 6 in spiral riveted. "In most cases the leaks on wood pipe were found on the collars, caused, we believe, by the contraction and expansion of the pipe line."

The costs for the distribution system are divided under the heads of operating labor, \$756; maintenance, \$743 for mains, \$139 for valves, \$640 for hydrants. The total costs of the department for the year are given as \$8,793 for pumping, \$2,507 for distribution, \$4,187 for commercial, \$489 general, and \$228 undistributed; a total of \$16,203.

## Competing Water Works in Livingston

**Unfortunate conditions seemed to make it necessary for this Montana city to build a municipal plant in competition with a private one, and the latter has been practically driven out of business.**

Livingston, Montana, the population of which is about 8,000, has for about a year been served with two water works plants, one private and the other owned by the city. While this is a practice which is not generally to be commended, it would seem that the city was justified in building a competing plant in this particular case.

The water company's source of supply was the Yellowstone river, which at times is subject to pollution and during the spring months is very turbid. The State Board of Health made sanitary surveys of the river and recommended filtration and chlorination. The company, however, declined to follow out these suggestions. Because of dissatisfaction with the quality and pressure of the water, the city had endeavored to purchase the property from the company in 1911, at which time it contended that the franchise it had granted to the company expired; but the company declined to confer with the city's representatives or to make any effort to reach an agreement. Under these conditions, the city considered that its only alternative was to install its own plant. Some years later, acting under the advice of its engineers, and rather than enter into a competitive business, the city officials renewed their efforts to purchase the plant, even offering considerably more for it than an entirely new plant could be built for. The engineers had estimated the cost of reproducing the property at \$165,662; also estimating that a plant new and modern in every respect could be built for \$225,000.

Following these repeated failures to obtain the plant by purchase, the city voted \$260,000 bonds for a complete new plant, including a modern filtration system and an intake located above the outlet of all surface drainage from the city. Injunction suits against the bond election, against the selling of the bonds, against letting contracts and other

steps were successively brought by the company, delaying the furtherance of the project, but eventually the city's plant was constructed and has now been in operation for about a year.

The municipal plant contains 14½ miles of mains as compared to 10½ of the private plant; the fire hydrants number 138 as against 96 in the private plant; the storage reservoir has a capacity of 1,000,000 gallons as compared to 415,000; the average domestic pressure is 70 pounds as compared to 35 to 45; and the water is filtered and is considered to be both safe and attractive instead of being of doubtful quality and high turbidity.

During the year of operation the municipal plant has connected 1,180 services to its mains, while the private plant's connections have fallen from 1,330 to 300. It is estimated that the gross income for the coming year will be approximately \$35,000. In addition to having safe and attractive water, the citizens have enjoyed a large reduction in their fire insurance rates due to the better protection offered by the municipal plant. The later negotiations and construction have been under the charge of Burns and McDonnell, as consulting engineers, J. A. Cortese, superintendent, and a water committee consisting of J. W. Fryer, A. J. Huffer and the chairman, H. S. Masters.

### Safe Blasting

The Aberthaw Construction Co., Boston, in putting up several one-story houses at Lockport, New York, found it necessary to excavate 4,000 or 5,000 yards of rock and installed a motor driven compressor to supply air through 6 or 8 drills with which very satisfactory results were obtained, averaging 16 feet per hour per drill.

The holes were fired in small groups some of which were very close to the railroad track and two wooden office buildings of light construction and having numerous windows. In order to prevent damage from flying stones, each group of holes after being charged with explosives was covered by a bundle of small logs lashed together with rope. When the shot was fired the rock and earth rose several feet in a solid mass covered by the bundle of logs which, although partly disconnected by breaking some of the lashing, still held together close enough to prevent dispersion and maintain an effective shield that prevented stone and fragments from flying upwards or at a large angle in any direction and thus confined the effects of the blast strictly to its locality and prevented any damage to adjacent structures.

The broken rock settled back on the surface of the ground in a solid pile still covered by the logs so that the latter need only to be straightened and bound together for the next blast while the spoil remained in a compact heap ready for easy removal. The cost of the protection was so small as to be negligible both for materials and time and labor and it was so efficient that not even the glass in the close by building was broken but remained in exactly the same condition as before the shot, as is shown by the photographs taken before and after, by Supt. H. V. Sheehan in charge of the work.

### Highway Appropriations in Vermont

In connection with the highway data recently furnished us, George W. Plumb, district highway commissioner, informs us that in Vermont the state appropriates for each town \$1,000 or any part thereof not less than \$100, provided a similar sum is appropriated by the town in question, the total to be used for the permanent improvement of selected highways. In addition to these, there is always available an appropriation known as the 5 per cent fund. The state levies a highway tax of 5 per cent on the "Grand List" of each town and then reapportions it pro rata upon the town road mileage. This also is used on selected highways. The state also donates a few hundred dollars to each town to be expended in the improvement of unselected highways or town roads.

The state contributes two dollars to the town's one, up to \$1,500, to be used for resurfacing. The state patrols the main lines of travel at a cost to the towns of about 25 per cent.

### Highway Instruction at Drexel Institute, Philadelphia

Drexel Institute, Philadelphia, through its evening school has arranged a course in highway engineering, and the director has requested us to give publicity to the fact that the institute has secured the services, for the purpose of this course, of Charles F. Puff, assistant chief engineer of the Bureau of Highways of Philadelphia, Otto T. Mayer, assistant engineer of the Bureau of Highways, and Julius Adler, consultant to the Atlantic Refining Company. There will be field work correlated with the class-room work. The course will be given on two evenings a week and Saturday afternoon.

### Highway Notes

An attempt is being made to restrain the state highway engineer of Louisiana from letting the contract for the Hammond-New Orleans highway. The reason for this action is that the \$700,000 provided for this road and the Chef Menteur road were to be spent so that the Chef Menteur road should be completed or at least amply provided for before the contract for the Hammond-New Orleans highway should be let. Duncan Buie, state highway engineer, was about to let the contract for part of this road to T. G. Womack for \$59,541.08, and contended that the \$450,000 set aside for the Chef road was amply sufficient.

Well founded objections have been raised to the proposal making five years' previous residence in the state mandatory for eligibility for New Jersey state engineer of highways.

The Board of Freeholders of Elizabeth, N. J., has passed a resolution requiring county municipalities to secure and pay for all rights-of-way before the county will order any roadway work improvements.

Kentucky is planning for a system of highways 3,500 miles long to be constructed and maintained by state funds supplemented by Federal aid. During the next two years the state will have approximately \$10,000,000 to expend on highways. Elimination of bad grades and dangerous crossings and the adaptation of surfacing materials to traffic demands is contemplated.

Syracuse plans to lay 6½ miles of new and resurfaced pavements this year.

A bill has been presented to the Kentucky Senate for a tax of 50c. per gallon on whiskey as it is released from bonded warehouses, which it is expected will raise \$20,000,000 that will be appropriated for road building.

The state of West Virginia has about \$20,000,000 available for road building in 1920, three counties, namely, Kanawha, Fayette and Monongahia counties, having funds of more than \$1,000,000 each available.

### A \$3,000,000 Sea Wall for Corpus Christi, Texas

The city of Corpus Christi is located chiefly on a 42-foot bluff overlooking the harbor, while the business district and part of the residential section is built on a beach at the foot of the bluff, and only about 4 feet above sea level. Last September a tropical hurricane struck the city causing the loss of hundreds of lives and millions of dollars worth of property, and resulted in the change of the plan for a low sea wall, to a much heavier and higher wall located 600 feet beyond the present shore line. Plans and specifications have been prepared and adopted for a wall 16,000 feet long, of which construction on the first 3,000 feet will be commenced about April 15. The wall will be of concrete with a curved face and a height of 12 feet above city datum or 2 feet above the highest water on record. It will have a pile foundation and a sheet pile protection in front, and will be rip-rapped at the toe and the bay filled in to form a bathing beach in front of the wall.

In the rear of the wall the backfill will be graded on a 1 per cent. slope for a distance of 200 feet to a height of 14 feet above the city datum. The first 50 feet will be paved and retained by a small bulkhead. From the crest the fill will slope downwards 400 feet on a 2½ per cent. to the level of Water street on the present shore line. All of the water collecting on the inner edge of the fill will be drained into an intercepting storm sewer and pumped into the bay.

As soon as the first section of the wall is completed, transverse temporary bulkheads will be constructed at the ends and earth dikes will be continued across the beach to the foot of the bluff to protect the most exposed part of the city. Streets will pass through the dikes but can be closed in emergency with sand bags kept in reserve for that purpose. Robert J. Cummins, Houston, consulting engineer.

# PUBLIC WORKS.

243 West 39th Street, New York, N. Y.

by

Municipal Journal and Engineer, Inc.

Published Weekly at  
Subscription Rates

United States and Possessions, Mexico and Cuba....\$3.00 per year  
All other countries .....\$4.00 per year  
Entered as second-class matter January 3, 1906, at the Post Office  
at New York, N. Y., under the Act of Congress of March 3, 1879.

Change of Address

Subscribers are requested to notify us promptly of change of  
address, giving both old and new addresses.

Telephone (New York): Bryant 9591  
Western Office: Monadnock Block, Chicago

A. PRESCOTT FOLWELL, *Editor*  
FRANK W. SKINNER, *Associate Editor*

## False Pride

All have heard, probably, of the two small boys, one of whom in a boasting tone announced that his father had just had a new roof put on his house, which was met by the proud announcement of the other that his father had just had a mortgage put on his. Some people can boast about almost anything, but we think it remains for the city of Chicago to boast about the enormous quantities of water which it wastes. We have just received a pamphlet bearing the title "Boost Chicago," followed by the announcement on the front cover, "We pump more pure water per capita than any city on earth and at a lower cost." Within the cover the pamphlet states that Chicago now has seven cribs with 64 miles of lake and land tunnels in use, representing a total expenditure of \$22,000,000; that it has ten major pumping stations representing \$13,000,000, which are capable of pumping 900,000,000 gallons a day; that New York City, with over double the population, pumps only 650,000,000 gallons a day, while Chicago pumps 880,000,000, giving an average per capita consumption of 240 gallons a day, with a peak load running over 300 gallons.

A few other statements tending to increase the disgrace about which the city boast are given in striking figures. For instance, "The water pumped in Chicago in one year would cover the entire area of the city to a depth of over seven feet." "One day's pumpage placed in ordinary kitchen pails put side by side would reach around the earth at the equator almost twice." To prove that Chicago can have as much water as it want to pump and pay for, figures are cited to show that, at the present rate of pumping, it would require 5,900 years to pump out the quantity of water in the lake at one time, and that, if the water in Lake Michigan were placed in 40-gallon barrels, set side by side, they would make a belt around the middle of the earth 235 miles wide.

The pamphlet referred to is attractively gotten up and is confined exclusively to amplifications on the large volume of water consumed by Chicago. The comparison to the small boy's boast of the mortgage is by no means a fanciful one, for it has been demonstrated that half of the water pumped is wasted without doing a particle of good to any citizen of Chicago (unless the coal dealers and pump

manufacturers), that if the consumption were kept down where it should be, fully \$5,000,000 could have been saved on pumping stations and considerably more on tunnels and cribs and probably an equal amount on mains. This \$15,000,000 was raised by selling bonds—that is, by putting a mortgage on city property—and the taxpayers are paying interest on this money as well as the cost of pumping half a billion gallons a day without receiving any benefit therefrom. That Mayor Thompson, whose name is signed to the pamphlet, or any other citizens of the city should find it a matter for boasting that Chicago is asking its taxpayers to throw away more money on pumping unnecessary water than any other city in the country strikes us as decidedly humorous—for everyone except Chicago's taxpayers.

## The Value of Precedent

With an unlimited command of time, money, materials and men, a very indifferent engineer can eventually construct great and difficult work. The high essentials of the art of engineering consist, however, in executing the work with the maximum rapidity, safety, economy, efficiency and durability, and it is the ability to secure results that are best possible in every way which distinguishes the master engineer.

While engineering, especially construction engineering, is essentially a creative art, its operations are seldom sudden or radical, and it is largely founded on well demonstrated, mathematical and scientific and mechanical principles steadily developed and applied to produce standard materials, methods and operations that are well proven and cover so wide a range that their judicious combination, selection and revision, modification, or extension leaves little of the present field of requirements uncovered.

The able engineer achieves his success by the thorough investigation, accurate and complete analysis of the problem and the application to it of the most approved and up-to-date practice, rarely attempting experiments or risking uncertainties; always providing in advance for every reasonable contingency and equipped with a reserve of supplies and resources to meet any possibility occasioned by unforeseen conditions or remote contingencies.

It is a wise combination of patient detailing and absolute thoroughness and accuracy of routine that brings the best results rather than careless brilliancy that unnecessarily tries new methods and ventures into strange paths.

Established precedent is therefore of prime importance in construction work and the official who is responsible for a variety of public work, as are municipal, state and federal authorities, cannot be expected to be individually conversant with all the elaborate features of many different kinds of construction. It is both his duty and his privilege, in cases of unusual difficulty or importance, to summon to his aid, experts in a special field to solve the problem in accordance with the indications of previous results. This is especially true in the building and rebuilding of large bridges under diffi-



cult requirements of traffic, navigation or local conditions. Except in a very few cities such for instance as New York, or those existing on opposite banks of large rivers, bridges are incidental rather than universal units of public works, while in the railroad systems they are among the most important and numerous of the structures, and are consequently in charge of highly trained specialists in their design and construction. These men and the independent experts form a class by themselves and are by way of almost achieving miracles in their chosen field. Their cooperation or the imitation of their successful work is, therefore, a proper and necessary resource for large problems of municipal and highway bridge construction where the application of their methods instead of the efforts to secure independent or novel operations is often likely to effect a great saving of time and money and promote the convenience and safety of the public.

The method of reconstructing two long spans of a great railroad bridge, which is described on page 345 provided equally for traffic and navigation, safeguarded against floods and assured safe and reliable work where great danger, delay and expense might have resulted from some other treatment of the problem.

In this great structure, three radically different plans, each founded strictly on sound practice, but offering a novel combination of methods, were approved for the different river spans, as described in this and other articles in Public Works, besides a wholly different and unusual method of replacing the shore viaduct. While specifically railroad work this is very applicable to municipal and highway work and merits the attention and the appreciation of engineers and officials interested in it.

### Help Improve Transportation

The greatest difficulties now encountered by construction interests in this country are labor materials and transportation. Improvement in the condition of any one will greatly help increase production and promote lower prices that will rapidly improve business conditions of all sorts and make possible a return to safe and prosperous business.

We are still suffering the dislocation of transportation service due to war conditions and to the impaired and depleted equipment of the railroads who have not enough rolling stock and whose cars have been returned from government control in bad condition. It is impossible to get enough new cars quickly to fill demands and serious congestion and delay of freight results. A study of the official records shows, as noted in another column, that at present the cars are actually transporting freight little more than 9 per cent of the time, while more than 22½ per cent is occupied in loading and unloading it and the remaining 68 per cent includes a very large amount of unnecessary waste time. Apparently, therefore, at least one-third of the total time might be added to that now usefully employed by the cars which would just about double their present efficiency. About five hours a day is now occupied in loading and unloading and in waiting for loading and unloading and if only one hour of

this time was saved and applied to transportation, the result would be a 10 per cent increase of freight movement without involving any extra expense for new equipment.

It is highly important that every large shipper or receiver of freight should realize the significance of this fact and place his orders so as to permit the utmost concentration, continuity and rapid completion of loading and be ready to unload and release the cars without any delay whatever. This would in no way increase his expenses but on the contrary would effect an independent saving. One way in which it can be materially facilitated is by the installation of handling machinery wherever applicable and justified by the amount of business. Another way is by preparation and strict adherence to schedules of operation and the employment of trained men held strictly responsible for the work.

### Recent Progress in Sanitary Engineering

As a part of the annual report for 1919 of the New York State Health Department, there is published a report of the Division of Sanitary Engineering, which contains a number of interesting summaries.

First is given a brief statement of the work of the Division, which is stated to comprise "the examination and approval of plans for sewerage and sewage disposal; the investigation and control of the sanitary quality of public water supplies; the investigation of public nuisances; the examination under order from the governor into conditions of nuisances affecting life and health; the examination of the sanitary conditions of state institutions; the inspection of sewage disposal plants; the investigation of the construction and operating efficiency of milk pasteurizing plants; the examination and approval of plans and expenditures for county mosquito extermination commissions; assistance to boards of supervisors in the matter of water supply and sewage disposal at county tuberculosis hospitals; the investigation of typhoid fever outbreaks, due to waterborne infection; consulting advice of a general nature to municipalities, corporations and individuals in regard to water supplies, sewage disposal and general sanitation; and educational and research work so far as possible within resources available."

#### WATER SUPPLY AND SEWERAGE.

Concerning advance in water supply and sewage disposal, the author of the report states:

"Broadly speaking, the development of scientific knowledge and experience during the year in regard to both water supply and sewage disposal has been substantial. In the water supply field considerable additional knowledge has been gained in regard to disinfection of water generally and particularly under military and other emergency conditions. In this latter field also we witness the application of new methods of filtration, such as the drifting sand filters at Toronto, and the use of the pressure sedimentation tanks in connection with pressure filters.

"In the sewage disposal field we find a corresponding added knowledge in purification methods, particularly in regard to preliminary treatment.

Self-cleansing sewage screens, more uniform and effective sedimentation velocities in tanks, mechanical means of sludge removal in sewage tanks, and more economical and effective methods of applying air and operating tanks in the "activated sludge" process, are lines along which research and experimentation have been successfully carried on during the year. So important in fact has been this acquisition of knowledge that there is good reason to believe that some of these new devices will, on account of their simplicity, efficiency, or economy, supplant in part at least present methods of sewage treatment."

Attention is called to the increased number of water purification plants installed in the state during the year 1919. New filter plants or additions to existing plants were established at five cities. Chlorination plants or additional units were installed at eight cities. With the addition of these plants purified water is now served to nearly 7,000,000 inhabitants of the state or 64 per cent of the total population. The significance of these improvements is illustrated by the fact that, while the typhoid rate in the state in 1906 (the year the Engineering Division was established) was approximately 20 per 100,000 of population, it had been reduced to approximately 3.5 at the close of 1919.

## Concrete Sewer Standard Specifications

### Specifications for sewer forms and for reinforced concrete pipe recommended by the American Concrete Institute.

(Concluded from page 337)

#### Concrete Sewer Forms.

The standard specifications recommended by the Committee of the American Concrete Institute provide that:

Section 50. Forms for slabs or very flat arches, as in box sections or roofs of special chambers, shall remain in place for at least seven days. No load shall be placed on the concrete for fourteen days, and then only with permission.

#### ARCH FORMS.

Arch forms shall not be slackened until the backfilling has been carried to a height of at least one foot above the top of the arch and tamped. Arch forms shall remain in place for forty-eight hours when conditions are most favorable for the hardening of the concrete and for a longer time, as may be directed, during inclement weather, or where unusual conditions exist. Permission for dropping center must be secured for each arch unit.\*

#### BACKFILL.

Backfill, over and around arch sewers, shall be placed as soon as possible after the cement has set. The filling up to a plane two feet above the top of the arch shall be made from the best earth, and shall not contain a sufficient amount of large

\*For small arches, six feet or less, and under the most favorable conditions, forms may be dropped in 24 hours.

stones as to allow the pieces of stone to become wedged. It should be filled in layers of not over six inches and carefully tamped.

If the remainder of the backfill is dumped from buckets, the contents of the buckets should not be allowed to fall more than five feet, unless the impact is broken by timber grillage. Bracing should generally be removed only when the trench below it has become completely filled and every precaution shall be taken to prevent any large slips of earth from the side of the trench onto or against the green arch. All voids left by withdrawal of sheeting shall be immediately filled with sand by ramming with tools especially adapted to that purpose, by watering or otherwise as may be directed.

#### Manufacturing and Testing Reinforced Concrete Sewer Pipe.

The standard specifications recommended by the Committee of the American Concrete Institute provide that:

Section 53. Reinforced concrete sewer pipe shall be made circular or egg shape in cross-section and circular pipe made in sizes from 24 inches to 96 inches inside diameter. Opposite diameters shall be true with a permissible variation of not more than three-quarters of one per cent.

Section 54. Reinforced concrete sewer pipe shall be in sections of not less than 3 feet in length, and ends so formed that when laid together and cemented they shall make a continuous and uniform line of pipe.

Section 55. The provisions of Sections 1 to 11, inclusive, specifying materials for monolithic sewers, shall apply to materials for concrete pipe, and the provisions of Sections 20, 21, 22 and 26 shall apply to its manufacture. All concrete shall be proportioned 1 bag Portland cement, 2 cu. ft. fine aggregate, 4 cu. ft. coarse aggregate.

#### FORMS AND CURING.

Section 56. All pipe shall be made in forms composed of sheet steel cores and casings, and cast-iron bottom and top rings which form the joint. The forms shall be rigidly held together, and the core and casing so placed as to insure uniform wall thicknesses.

The top rings, cores and casings shall not be removed from the pipe until the concrete has obtained its final set.

Pipe shall not be lifted from the bottom rings until the concrete is from 60 hours to 72 hours old.

After the cores and casings have been removed from the pipe they shall be kept constantly and thoroughly wetted by sprinkling with water at least three times a day until they are removed from the bases and yarded. After being placed on the yard the pipes shall be sprinkled thoroughly at least three times a day until they are six days old.

All pipes shall be marked with the date of their manufacture, and no pipe that is not 14 days old will be permitted to be laid unless it has been steam cured.

#### STEAM CURING.

Pipe may be cured by the use of wet steam in the following manner: After the pipes have been cast they shall be covered with canvas or other material known as steaming jackets and wet steam be

turned into these jackets for one day after casting. Then the casings and cores may be removed and the steam again applied in the same manner for one day. After this has been done the pipes may be removed from the bases and yarded, no other curing being necessary. Steam cured pipes may be laid when they are six days old.

#### TESTS.

Section 57. Any or all of the following tests may be applied to samples selected by the engineer from the pipe delivered on the work. For the purposes of making such tests, the contractor shall furnish and deliver, when directed, and at the place required, five lengths of each size pipe used in the work.

Section 58. (a) When supported at the bottom upon a knife edge one inch in width, in such a manner that an even bearing is provided throughout the whole length, exclusive of the bell, and load is applied at the crown uniformly through a similar knife edge, the various sizes of pipe shall withstand, without signs of distress, the following loads in pounds per lineal foot: 24-in., 2,149 lbs.; 27-in., 2,369 lbs.; 30-in., 2,583 lbs.; 33-in., 2,830 lbs.; 36-in., 3,080 lbs.; 39-in., 3,300 lbs.; 42-in., 3,521 lbs.

(b) Sand bearing loads equivalent in value to the knife-edge loads, 24-in., 3,070 lbs.; 27-in., 3,370 lbs.; 30-in., 3,690 lbs.; 33-in., 4,040 lbs.; 36-in., 4,400 lbs.; 39-in., 4,710 lbs.; 42-in., 5,030 lbs.

(c) When supported upon a sand saddle which extends the full length of the pipe, exclusive of the bell, and whose upper surface fits accurately the outer curved surface of the pipe, and whose width is equal to an arc of fifteen degrees, in such a manner that an even bearing is provided throughout the whole length, and the load is applied at the crown uniformly through a knife edge one inch in width, the various sizes of pipes with diameters greater than 42 inches shall withstand the following loads per lineal foot: 48-in., 3,800 lbs.; 54-in., 4,400 lbs.; 60-in., 5,000 lbs.; 66-in., 5,500 lbs.; 72-in., 6,000 lbs.; 78-in., 6,500 lbs.; 84-in., 7,000 lbs.; 90-in., 7,500 lbs.; 96-in., 8,000 lbs.

#### ABSORPTION TEST.

Section 59. The specimens for absorption tests shall be sound pieces with all edges broken, and may be from pipes broken in the crushing test. One specimen shall be selected from each pipe broken in the crushing test, or may be taken from other pipes. They shall be from 12 to 20 square inches in area, and shall be as nearly square as they can be readily prepared. They shall be free from observable cracks, fissures, laminations or shattered edges.

#### DRYING.

Preparatory to the absorption test, the specimen shall be first weighed and then dried in a drier or oven at a temperature of not less than 110 degrees C. (230 degrees F.) for not less than three hours. After removal from the drier the specimen shall be allowed to cool in dry air to room temperature and then weighed.

If the specimen is comparatively dry when taken, and the second weight closely agrees with the first, it shall be considered dry. If the specimen is wet when taken it shall be placed in the drier for a drying treatment of two hours and reweighed. If the third weight checks the second, the specimen

shall be redried for two-hours periods until check weights are obtained.

#### WEIGHING.

The balance used shall be sensitive to five-tenths (0.5) grams when loaded with 1 kg., and weighings shall be read to the nearest gram. When other than metric weights are used the same degree of accuracy shall be obtained.

#### IMMERSION.

The specimen, after final drying, cooling and weighing, shall be placed with other similar specimens in a suitable wire receptacle, packed tightly enough to prevent jostling, covered with distilled water or rain water, raised to the boiling point, and boiled for five hours, and then cooled in water to room temperature.

The specimen shall be allowed to drain for one minute, and, the superficial moisture having been removed by towel or blotting paper, the specimen is then placed upon the balance.

The test result shall be calculated as percentage of the initial dry weight.

The results shall be reported separately for each individual specimen, together with the mean for all the specimens from the same shipment of pipe.

Each specimen shall be marked so that it may be identified with the pipe used in the crushing test from which the specimen was taken. The marking shall be applied so that the pigment shall not cover more than one per cent of the total superficial area of the specimen.

The maximum allowable absorption shall be 12 per cent.

### Delaware River Bridge and Tunnel

Vigorous efforts are being made by the Mayor of Philadelphia, endorsed by the Governor of Pennsylvania, to secure the construction of a long span bridge across the Delaware River from Philadelphia to Camden. The minimum cost, exclusive of the expensive approaches, is estimated at \$20,000,000, and the construction is considered assured. In addition to the bridge, the Mayor also insists on the necessity for a supplementary tunnel that is needed to help care for the present traffic of 46,000,000 passengers annually on the crowded ferry system and for the increasing traffic of the future.

### Stockton, California, Proposes a \$5,000,000 Inland Harbor

According to plans submitted to the Stockton City Council by Sherman A. Jubb, engineer, provision is made for the construction of a great freight and passenger terminal and large improved docking facilities that will cost about \$5,000,000 including \$2,000,000 from a Federal government appropriation now pending.

The work will require the development of the present Stockton channel now used for docking river steamers to adapt it for deep water vessels; the filling of the lower end of the present Mormon channel to provide for new industrial developments, and the cutting of a new outlet for it which



will also serve as a waterway for smaller vessels heretofore using the Stockton channel; construction of municipal railroad yards on north and south of the Stockton harbor; construction of a belt line railroad; and the dredging away of Weber Point, providing a turning basin for vessels of 10,000 tons. The plan is endorsed by the city commissioners and, if adopted, the expense will be paid by the city, except as provided for by government appropriation.

### Utah Irrigation and Water Improvement Scheme

It is proposed to construct dikes on the east, south and north shores of Utah Lake to increase the storage capacity for the rainfall on 2,000 square miles of mountain and valley. This, it is estimated, will furnish 253,000 acre-feet of water now flowing into the Utah Lake and the Jordan River, and will suffice for the reclamation of 204,160 acres of

land in Cedar Valley and in Utah County, besides the retaining of 30,000 acres in Rush Valley, 20,000 acres in Tooele County, 38,000 acres on the east side, and 20,000 acres on the west side of Salt Lake Valley. The water will also be made usable for domestic purposes by the diversion of all alkaline waters.

The diversion works will involve the construction of 60 miles of canal, 250 feet wide at the top, 100 feet wide at the bottom and 20 feet deep, together with pipe lines from 3 to 8 feet in diameter and pumping equipment at an estimated expense of \$6,000,000 to \$8,000,000.

The cost of delivering water on the ground will be from \$40 to \$50 per acre and much of the land is already under cultivation with a present value of \$75 an acre, which it is expected, when water is available, will immediately be increased to \$200 per acre. Data for this scheme have been prepared by Chas. S. Brown, engineer, Walker Bank Building, Salt Lake City.

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## The Labor Field

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**No large supplies of unemployed laborers available in the New York district. Demand is greater than supply. New methods eliminate large gangs in many kinds of work. Forces recruited largely by individual solicitation.**

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In and around Greater New York conditions have changed mightily since a few years ago when a thousand men or more could be had, on short notice, delivered in groups or regiments.

Scarcely more than half a dozen years ago heavy construction work in general was handled by carpenters, masons, bricklayers, steel erectors or house-smiths, dock builders, hoisting engineers and a sprinkling of special mechanics together with a large body of laborers for excavating, concrete work, floating gangs and miscellaneous services. The latter kinds of work have been specialized, subdivided, and classified until now there are many distinct grades each claiming privileges and making demands that frequently overlap so as to cause difficulty, confusion, and sometimes strife.

A much smaller proportion of the ordinary work is now considered as labor and the jealous distinctions and restrictions cause much delay, extra expense and duplication of work. These with other conditions have been important factors in developing not only different types of design but in the perfection and installation of much more power machinery to take the place of hand labor and improved appliances for conveying and handling material so that a given piece of work is now accomplished with less men than in former times.

Another development of the present situation is due to the fact that the long cessation of non-essential construction during and subsequent to the war

has practically eliminated railroad and terminal work that formerly employed large forces for excavating, grading and other heavy operations and bulk requirements. There are now, and recently have been, few or no railroad extensions and terminal works, canals, dams, reservoirs and the like have been restricted as much as possible, harbor and river improvements postponed, and the men that were occupied in such employment have been so thoroughly dispersed that they are not now available in large bodies as formerly.

Some kinds of work have been necessarily prosecuted such as the completion of great aqueducts and water supplies under construction, necessary sewers and the like, and in these cases large and rapidly increasing use has been made of power equipment such as trench machines, dragline scrapers, standard and special steam shovels, loading, unloading and conveying apparatus, and other plant reducing the amount of hand work.

Formerly in New York City and in many other places an abundant supply of skilled and unskilled labor could always be depended upon to apply on the job for work, the turn-over was relatively small, and no difficulty was obtained in hiring men at current prices. When one of the recent extensions of the subway system that has now been in operation a year or two, was contracted for the contractor's engineer estimated for a possible increase of nearly 100 per cent in wages to safeguard against any loss

and in so doing was vigorously opposed by the contractor, who reluctantly yielded to the engineer's judgment. For some months things went well with abundance of good labor until the work was interrupted by a big strike, after which there was a remarkable scarcity of labor and great difficulty was obtained in securing a minimum complement of men. There were no applicants for the job, and European hostilities being then well under way the exodus of foreign labor was so great that the small supply of competent men was completely exhausted and the only help available was that secured by hiring petty leaders who, for foremen's pay or perhaps a bonus in addition, would agree to furnish a gang of one or two dozen laborers that invariably proved to be old, feeble, crippled or otherwise very inefficient, yet demanded and received much increased wages. These men would soon begin to melt away and the whole gang would soon have to be replaced, involving much delay, dissatisfaction and multiplied expense for inferior services. The situation finally became so grave that this engineer made revolutionary changes in his manner of conducting the work, devised entirely new apparatus for handling it, and by his personal initiative and ability eventually succeeded in saving a situation that otherwise might have meant little less than ruin to the contractor. There are many similar examples, but not all of them terminated as favorably.

Formerly if a large force of men was needed promptly it was the universal custom to apply to one of many "Padrones," who could each control a crowd of foreign laborers and would deliver them on the job for so much a day per man, and who made fortunes on their commissions for labor and on the charges they collected from the men, many of whom could speak no English and were at their mercy. Today the padrones have almost or entirely disappeared from New York, so that an inquiry among several large employers of labor failed to locate a single padrone.

In the more responsible skilled classes of work such as foundation work, caissons, tunnel work and the like, the principal contractors have always found it necessary to retain a large and expensive standing organization with superintendents and a number of foremen and sometimes a few of the best workmen to form the nucleus for quickly selecting and training men for new jobs. These superintendents and foremen always had a following of the best laborers and mechanics with whom they kept in touch and who were ready to respond when new work was commenced. Sometimes on work of long duration and commanding high prices like caisson work, tunnel work, and other heavy construction, these men would travel half across the country to join a new job for their old employer. The same system still prevails as far as conditions permit, and at the present time men for new work in this vicinity are chiefly recruited by personal invitations from superintendents, foremen and assistants and by passing the word among the men themselves who so far as otherwise unoccupied and interested will respond in diminished numbers. These recruits are sometimes augmented by advertising in the daily papers, and wherever an employer with a deficiency of labor

happens to know of a surplus in some other town or city, he may send a special agent to hire men there. Some employers keep up recruiting almost continually by agents traveling from place to place through the country and hiring such men as are available and desirable.

The great fact remains that the general balance of labor is reversed within recent years. During the war the exodus from this country very greatly exceeded arrivals, and even now the immigration is very far below what it was in previous times, and far below requirements, so that there is unquestionably a serious shortage of labor and a prospect that it will continue indefinitely. There is no doubt that the entire country, including labor itself, would be much benefited by a large importation of labor, particularly of common unskilled labor, that would relieve the more intelligent, expert and experienced men of rough work and thus permit them to have easier jobs and earn higher wages in more agreeable occupations. When this is accomplished, and when organized labor is held strictly accountable for the execution of its covenants and is reliable and responsible, and when honesty prevails so that each workers willingly gives an honest equivalent for his pay and production is increased instead of wilfully diminished, the labor question will be far on the way to a satisfactory solution.

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### Irrigation Notes

In order to reclaim for purposes of irrigation between 1,000,000 and 3,000,000 acres of land in southeastern Montana, residents will attempt to divert the water from the Yellowstone Lake which now finds its way to the Atlantic ocean by way of the Mississippi river. It is planned to place water on millions of acres of the 500 mile valley of the Yellowstone river. A campaign has been started to raise \$50,000 for the preliminary work required before the construction of a dam at the point where the Yellowstone river leaves the lake can be undertaken. The construction of a dam will cost about \$300,000 and it is planned to apportion the water in the river, organize irrigation districts and construct canals.

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California is facing the most serious power and irrigation shortage in the history of the state, according to H. G. Butler, State Power Administrator. The precipitation this year has been less than fifty per cent normal up to date. If the present rate of water consumption is continued, the supply of water for power usage will be less than fifty per cent of the demand by August. It is planned to regulate the water for irrigation, eliminating for this year the rice growers of the delta lands.

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The possibilities of irrigation are illustrated by a recent announcement in the local press that 508 acres of irrigate<sup>1</sup> land in Des Moines County, Iowa, have just been sold in three large lots for a total price of \$133,050, and that before the establishment of the drainage district, the value was only a few dollars per acre.

A movement looking toward a comprehensive survey of drainage and land clearing possibilities in Northern Minnesota has been initiated and steps taken to have a survey made of conditions.

### Impounding the Colorado River

Former Secretary of Agriculture, Maine is said to recommend impounding the waters of the Colorado River in the Grand Canyon to provide for the irrigation of 1,500,000 acres of arid land, which it is claimed would be benefited to the amount of \$100 an acre.

Such a scheme, like that of damming the Niagara Rapids should not be too seriously considered until adequate surveys have been made and authoritative engineers report on the safety, efficiency, and ex-

pediency of detailed plans of construction and operation. Even then any utilitarian interference that will materially deface either of these most beautiful of nature's magnificent beauties should not be tolerated until the economic necessity becomes far greater than it is at present likely to be.

### Brazil Spending \$50,000,000 on Irrigation

Preliminary work has begun on the construction of great irrigation canals in the drought-stricken section of Northeast Brazil, for the relief of which the recent Congress appropriated \$50,000,000. It is planned to extend railroads into that section. The work is expected to be completed within five years.

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## Wood Block Paving

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**Discussion before the Western Society of Engineers brought out some points in the history of the development of this pavement. Walter Beuhler stated that bleeding was caused by the heavy oil used as a preservative in recent years, and that treatment with light oil and proper laying, both according to recent standard specifications, will prevent both expansion and bleeding, as well as decay.**

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The subject of wood block paving was discussed by the Western Society of Engineers at one of their recent meetings, the paper which formed a principal feature of the evening having been presented by Walter Beuhler, a representative of the Barret Company. The printed report of the meeting contains about equal amounts of discussion and of Mr. Beuhler's paper, showing the interest that was taken in the subject by the members.

Mr. Beuhler maintained that an examination of wood block pavements in the "Loop District" of Chicago showed that wood block was a good pavement, some of those in this district nine to twelve years old having by no means outlived their usefulness, although they have been subjected to the most severe traffic, most of the streets have double street car tracks, and, most severe treatment of all, the pavements were being constantly torn up for one reason or other.

In spite of this, he finds that the use of wood block pavements has fallen off very rapidly during the past five years, although a few cities like Minneapolis continue to use them. He did not pretend to explain this, but suggested that the high cost of the pavement has something to do with it, and also the fact that wood preservers found that they could secure better sales with less effort in other directions. Some of the opposition to wood pavements he believed was due to the swelling and bleeding which had become quite pronounced five or ten years ago, but which he believed could be overcome by proper treatment, which had only recently come to be understood and appreciated.

Concerning the decline in the use of wood block, Geo. W. Tillson, during the discussion, expressed

the opinion that this was largely due to the improvement in other pavements in smoothness and noiselessness and in the much more general use of rubber tires which also conduce to these results on streets which were noisy with the old steel tires.

#### EARLY PAVEMENTS.

Supplementing Mr. Beuhler's statements with those contributed in the discussion by Mr. Tillson, it appears that when the first pavement was laid in about 1900 the blocks were impregnated with 20 pounds of a mixture of one-half creosote oil and one-half rosin. Specifications adopted about that time by New York City provided that the blocks should not absorb more than 3 per cent of water when dried at a temperature of about 100 degrees for 24 hours. (The first pavement laid in Boston is, we believe, still in excellent condition having carried a heavy traffic for 20 years.)

In a short time, however, the expense of using rosin became so great that it was thought desirable to substitute something else. The theory was that the creosote would preserve the block, while the rosin or its substitute would keep the creosote in so that it would not evaporate. Engineers concluded that if a heavier oil were used it might have this effect, and specifications of the Association for Standardizing Paving Specifications and of the American Society for Municipal Improvements, adopted in 1911, called for a heavy oil containing a large amount of tar. Mr. Tillson apparently believed that this heavy oil was effective in preserving the blocks but, according to Mr. Beuhler, the use of this oil was immediately followed by bleeding which became seriously objectionable and even intolerable in many cases



## PREVENTING EXPANSION AND BLEEDING.

Mr. Beuhler stated that expansion can be eliminated and bleeding prevented without the use of a heavy tar or rosin, but by the treatment of the wood itself. He described this as follows:

"Southern pine, which is the wood most generally used in the central west and eastern sections, is, as you no doubt know, made up of elongated spindle-like fibres, closed at the ends and having hollow centers. The walls are pierced with small openings. Now it is an interesting and important fact that the cell walls will not absorb creosote except in very small amounts. While on the other hand they will absorb water, and in fact it is the water content of the fibre wall that has a direct bearing upon the contraction or expansion of the wood.

"A saturated piece of wood is expanded to its maximum. As moisture is evaporated no change in size takes place until the moisture is out of the cell structure, or hollow spaces in the fibres, and begins to come out of the fibre wall itself. This point is called the fibre saturation point. Any decrease of moisture in the cell wall will immediately result in contraction. A creosoted block therefore contains more or less moisture in the cell walls, depending upon its seasoning before treatment, and creosote oil in the cell openings.

"The creosote oil in the cell openings and on the cell walls acting as a waterproofing paint, retards, not entirely preventing, the evaporation or absorption of moisture. A heavily treated block exposed to the sun will lose enough moisture to appreciably contract and will when again subjected to moisture absorb it and expand. A block treated to refusal, which in southern pine might mean twenty-eight pounds per cubic foot, would of course be more water-proof than one treated with sixteen pounds per cubic foot. But as the creosote acts as a paint, it is not necessary or advisable to have a surplus of oil in the cell openings, approximately the same effect being produced by a uniform distribution of a smaller quantity of oil. In other words, it is better to regulate the treatment so as to get a better distribution of a small quantity of oil than to specify a large quantity, the larger quantity tending to produce bleeding. Sixteen pounds of oil per cubic foot of timber has been determined to be the most economical amount.

"Now as to the effect of quality of oil on expansion. It goes without saying that the heavier the oil the better waterproofing paint it will be. The heaviness, however, is limited by the necessity of uniform distribution throughout the wood and the practical time limit required to obtain this uniform distribution. Again it resolves itself into a question of treating methods rather than quality of oil.

"Now just what are the treating methods to which I refer? They can be stated briefly. First, the preparation of the wood for the injection of the preservative; second, the proper injection of preservative, regulating both the time and amount of pressure; and, thirdly, the cleaning of the surface of the blocks by steam and vacuum.

"The specifications for treatment as adopted by the American Wood Preservation Association reads as follows:

"Timber may be either air seasoned or green, but should preferably be treated within three months from the time it is sawed. Green timber and seasoned timber shall not, however, be treated together in the same charge. The blocks shall be treated in air-tight cylinders with the preservative heretofore specified. In all cases, whether thoroughly air seasoned or green, they shall first be subjected to live steam at a temperature between 220 and 240 degrees Fahrenheit, for not less than two hours nor more than four hours. Afterwards they shall be subjected to a vacuum of not less than twenty-two inches, held for at least one hour. While the vacuum is still on the preservative, oil heated to a temperature of between 180 degrees and 220 degrees Fahrenheit, shall be run until the cylinder is completely full, care being taken that no air is admitted. Pressure shall then be gradually applied not to exceed fifty pounds at the end of the first hour, nor one hundred pounds at the end of the second hour, and then maintained at not less than one hundred pounds, nor more than one hundred fifty pounds, until the wood has absorbed the required amount of oil. After this, a supplemental vacuum shall be applied in which the maximum intensity reached shall be at least twenty inches, and shall continue for a period of not less than thirty minutes. If desired, this vacuum may be followed by a short steaming period.

"Now the important factors in this specification, as outlined, are: "First, the condition of timber before treatment. It states that the timber may be either air seasoned or green, but in either case it shall first be subjected to live steam at a temperature between 220 and 240 degrees Fahrenheit, for not less than two or more than four hours. Now have in mind that this specification was drawn up with the object of obtaining a uniform distribution of the oil in the block—and that southern pine can be impregnated with about twenty-eight pounds per cubic foot—and we are trying to impregnate it with sixteen pounds of oil to the cubic foot, approximately half the amount—and uniformly distribute that smaller amount throughout the block. If the blocks were all thoroughly seasoned and the oil injected in that seasoned condition and the treatment stopped at sixteen pounds of oil per cubic foot we would then find the sap wood thoroughly saturated and the heart wood barely treated. In other words, thoroughly seasoned the sap wood is far less resistant to impregnation than the heart wood. On the other hand, if the timber were green and not steamed to permit of the impregnation of the sap wood, the sap wood, which is saturated with moisture and in a green state more resistant than heart, would receive less oil and the heart wood receive more oil, resulting in the rotting of the sap wood, so that it is important that, whether the timber be seasoned or green, it be first steamed in order to, in a measure, equalize the resistance of both the sap wood and the heart wood. Then, of course, after the steaming period, it calls for the vacuum, which is simply to remove the surplus moisture from the block. Then follows this clause: 'Pressure shall then be applied after the cylinder is filled with oil gradually, not to exceed fifty pounds, at the end of the first hour, nor more than one hundred pounds at the end of the second hour.' That is one of the most important clauses in the specification. If a high degree of pressure were applied rapidly the sixteen pounds of oil per cubic foot, which is approximately half the quantity which could be injected, would go into the less resistant blocks, treating them more heavily than the more

resistant blocks, and it would also fill the outer surfaces of the block and not be uniformly distributed throughout the block, so that the two factors—first, putting the wood in condition for impregnation, and then the uniform pressure slowly applied—are both essential to a uniform distribution. The third clause—steaming and vacuum—are not absolutely necessary, but if an oil has been used repeatedly it accumulates more or less sawdust and dirt, and a clearer block will result if the steaming and vacuum practice is followed. In other words, it has a washing effect.

"Careful observance of the specifications just described is the only preventive for bleeding."

Referring to the method of laying the blocks, Mr. Beuhler stated that the early practice was to lay them on a concrete foundation with a sand cushion, but during the past seven or eight years most of the cities using blocks have substituted a mortar cushion composed usually of four parts sand to one part cement, moistened just enough to spread easily. This prevented the objectionable shifting of the sand cushion which sometimes occurred, but it still held moisture, which the block could absorb from the bottom, expansion resulting.

#### BITUMINOUS PAINT METHOD.

Better than this, he believed, was the bituminous paint method which consisted in finishing the surface of the concrete base quite smoothly and painting it with a coat of a tar preparation not exceeding  $\frac{1}{8}$  of an inch thick. This was practiced abroad ten or twelve years ago, and in a few isolated cases in this country about the same time. One sample can be found in St. Louis and another in the little town of St. Boniface in Canada. The earlier practice was to lay the blocks on the paint while it was still hot, but later practice is to allow the paint to cool. The latter has the advantage of permitting an inspection of the surface of the block before the pavement is filled, removing any of the blocks if necessary for final inspection. The object of the paint coat is not to take care of any irregularities in the surface of the concrete, but to seal the bottom of the block. The blocks are sometimes rolled after having been laid to press them into the paint coat, but this will be effected sufficiently by traffic.

Although contractors objected that this method of construction would add to the expense because of the necessity of making a smooth finish to the concrete base, it was found that, if a concrete base proportioned about 1:2½:5 is worked the same as a one-course concrete pavement and finished with a long-handled float or a small roller, sufficiently even surface can be produced. In Minneapolis, where this construction is standard, the engineer in charge uses a 3-inch pipe about 15 feet long filled with sand and operated on wooden templates, the tops of which are at the grade of the finished concrete. By these means he secures an even surface both rapidly and cheaply.

It has been found that this method of construction is cheaper than the mortar bed construction, because the saving in sand and cement required for the mortar more than offsets the cost of the thin coat of pitch used and the labor of preparing the concrete surface. He reported that one city has

effected a saving of from 10 to 15 cents a square yard.

#### JOINT FILLING.

While the bituminous paint coat seals the bottom of the block, it is necessary also to fill the joints of the pavement in order to seal the sides of the block. Even with the improved method of treating and laying block pavements, there are still cases of bleeding, but most of these are probably due to an excessive amount of filler. The practice of filling the joints by smearing pitch back and forth on top of the block results in a surplus amount of filler on top of the block, which during hot weather gives the impression of bleeding. The filler should be heated to the proper temperature and then poured on the pavement and squeezed in with a squeegee pushed in one direction only, the joints of the pavement being filled from  $\frac{1}{3}$  to  $\frac{1}{2}$  full. Upon cooling, the pitch contracts and remains about an inch from the bottom, which is sufficient, for the object of the filler is not to fill the space between the blocks but to paint the sides of the block, and a small amount in the bottom of the joint, upon expansion, is squeezed up and results in distributing it over the sides of the block.

Mr. Beuhler emphasized the fact that traffic, by compacting the top of the block, tended to waterproof it on the top surface, and that where traffic was not heavy, considerably more care must be taken in the treatment of the block and in the construction of the pavement to effect thorough waterproofing.

### River and Harbor Notes

It is estimated that the development of the St. Lawrence River between Montreal and Lake Ontario to make it navigable for deep draught ocean steamers will cost more than \$50,000,000 and the development of the unused water power amounting to about 2,000,000 h. p. would cost about \$200,000,000 for work now under consideration by the International Joint Committee Commission of Waterways.

Arthur A. Stiles, state reclamation engineer of Texas, and George E. Kessler, Dallas city planning engineer, have completed plans for straightening the Trinity river bed, constructing levees and improving reclaimed lands. The plans contemplate levees 30 feet in height and 2,000 feet apart. Viaducts will be constructed across the 2,000-foot channel wherever necessary to facilitate travel.

The river Des Peres project, to be provided for by a proposed municipal bond issue, will recover for the city of St. Louis about 2,000 acres of land. The river channel will be straightened and deepened and in addition municipally owned tracks will be laid. The plan provides for the elimination of a menace to health, life and property and affords an opportunity for development.

The Brooklyn Chamber of Commerce is making renewed efforts to persuade Congress to authorize the construction of a 1,000-foot dry dock for the Brooklyn Navy Yard. Dry docks of this size are

available in Boston, Philadelphia and Norfolk, but in New York there is none larger than 725 feet long, although there are now 15 merchant vessels plying from this port that are of greater length, besides battle cruisers under construction in the Brooklyn Navy Yard and elsewhere.

### An Artificial Hydraulic Plant

An up-to-the-minute plan of juggling with millions and fascinating estimates is that recently inflicted on the public by the proposal of a ship and water power canal to deliver the waters of Lake Ontario to the Hudson River by way of an incision through "a ridge of earth and along the Mohawk River and Lake Oneida to the Hudson, thus providing for the use of as much water as is desired from the Lake Ontario run-off of 255,000 cubic feet per second at a head of nearly 245 feet, the elevation of Lake Ontario above sea level."

It is estimated that the scheme would only cost the trifling sum of \$500,000,000, and that it would produce 4,000,000 h. p.—years of sable energy at \$40 per horse power per year, which easily figures to the handsome sum of \$160,000,000 a year, thus paying for the whole outlay plus an insignificant surplus of \$14,000,000 in four years.

It is true that the ship canal from the south shore of Lake Ontario would have some pretty heavy excavation to get over the summit but this need give no anxiety since after cutting to as great a depth as is profitable, the water can be coaxed to flow over the top of the rocky ridge by the installation of "a battery of huge automatic, high efficiency, direct action, gas power pumps that have of late been invented and improved; so that an enormous mass of water can now be profitably elevated to a plane where it can flow over the top of such rock encountered between Lake Ontario and the Hudson River as it is not economical to remove." The pumps in question "are the simplest and most durable pieces of high power mechanism in use today and for every horse power exerted through them in uplifting water from the lake, there would be a gain from the fall of the same to the sea level of over 100 per cent."

### Laying 30-Inch Submerged Pipe With Divers

At Queensborough, Tasmania, 700 feet of 30-inch riveted steel pipe was laid by divers at a maximum depth of 26 feet below the surface of the water.

Sections of the pipe 48 feet long with flanged ends were riveted up on shore parallel to the water line, the ends temporarily closed with wooden bulkheads, the pipes rolled down inclined skids to the water and towed to position over a rip-rap foundation 3 feet high previously deposited on the mud bottom between alignment piles 100 feet apart.

The pipe sections were attached to tackles suspended from cantilevers on an 18 x 36-foot scow and operated by hand windlasses. The bulkheads were removed and the pipes were lowered to position on the rip-rap where the successive sections

were bolted together by divers, who also set over the pipes, anchor chains 100 feet apart with the ends attached to concrete blocks sunk in the mud on each side of the pipe. The pipe was covered with a broken stone fill on top of the rip-rap and the side piles were removed, completing the work.

### Repairing Decayed Trestles

A committee of the American Railway Bridge and Building Association, in reporting on renewals and repairs for timber trestle viaducts, says that when one-third or less of the piles in the bents are in bad shape, satisfactory repairs can usually be made by cutting off in solid material to a depth of 4 feet below ground line and setting on the old pile a post, spliced to it with four 3-inch slabs.

Where entire bents are to be removed, the new bents should be framed without a cap, set up and made ready to slip in as soon as the old piles are cut off. In other cases, new piles may be driven and sawed off alongside the old bents, after which the latter is cut out and the new bents pulled into place on the new piles.

## New Design for an Asphalt Road

**The author proposes a design for using sheet asphalt on highways, with concrete shoulders; also for constructing this in successive half-width sections.**

By Hugh J. Fixmer

The character and volume of traffic now using the through route highways approaches and even exceeds the traffic on the typical city street. It appears obvious that the type of pavement that has proved satisfactory for city streets might be successfully employed on heavily travelled roads. We have passed through an era of long experimentation in the design and construction of roads and pavements. We have learned many things. New designs must be based on the lessons learned from past failures, as well as the triumphs of successful experience. There are certain basic facts that the designer of road structures must observe. The effect of the paved surface on the user is as important as the effect of the traffic on the pavement.

The fundamental purpose of paving is to provide a smooth surface for the traffic. A pavement is judged by its surface. The pavement surface must prove safe and comfortable to use, must be efficient, economical and present a good appearance.

Materials of construction must be used to their best advantage if efficient and economical results are to be achieved. The sub-grade must be given serious consideration in connection with the choice of type of construction and the determining of the necessary thickness of the base. To secure uniformity, the thickness of the accepted base may be



varied to compensate for the poor sub-grade or inadequate drainage. As a general rule, in order to withstand loads and impact a macadam base must be approximately twice the thickness of a good concrete base. Many of our new roads of monolithic construction are disfigured by longitudinal cracks.

An irregular formed crack is a source of weakness, shortens the life of the pavement, adds to maintenance cost and presents an ill appearance. In order to provide against longitudinal cracking due to the effect of impact and frost action, it can be shown that the thickness of a monolithic slab must vary approximately as the width of the slab or road. The thickness at the center should be about one-twentieth of the width of the slab. The tendency to build roads wider entails an increase in thickness, and therefore in cost, of monolithic slab roads, like concrete or monolithic brick.

The roadway on all important roads, due to the speed of vehicles and width of trucks, should be of permanent construction for a width of at least twenty feet, with durable shoulders at least four feet in width, or temporary shoulders at least six feet in width.

Fig. 1 shows a typical monolithic road as recently built. The center thickness should be twelve inches and the shoulders, being of earth, six feet wide.

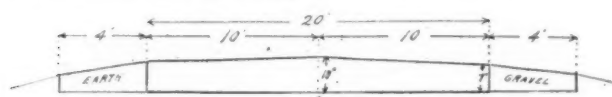


FIG. 1.  
TYPICAL CONCRETE OR BRICK ROAD.

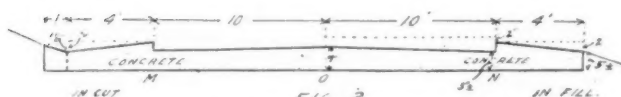


FIG. 2.  
PROPOSED CONCRETE BASE AND CURB-SHOULDER.

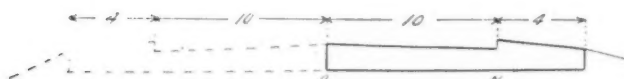


FIG. 3.  
CONSTRUCTING ONE HALF OF ROAD BASE (1/2 open to traffic).



FIG. 4.  
CONSTRUCTING ONE HALF OF ROAD COMPLETE.



FIG. 5.  
COMPLETE ROAD. ONE HALF BUILT COMPLETE AT A TIME.

A new type of road construction has been evolved based on the requirements of modern traffic and past experience in the construction of city pavements, which should prove economical and efficient. It is the standard sheet asphalt pavement adapted to road construction. It comprises a concrete base formed in one piece (Fig. 2) or in two parts (as shown in Fig. 3 and 4). A concrete "curb-shoulder"

four feet in width is constructed monolithically with the base. The asphalt wearing surface, composed of a binder course ranging from one to two inches in thickness and a top course varying from one to two inches in thickness, depending upon the kind and volume of traffic, is placed in the recess formed between the curb-shoulders.

Referring to Fig. 2, the type of curb-shoulder shown on the right is used where the road is built on a fill or on level ground. The type of curb-shoulder shown on the left is used in cuts and acts as a gutter to carry surface water to a convenient outlet. Since only the surface of the curb-shoulders is exposed to use, very little finishing is required and the work can be done rapidly using a simple, uniform templet.

Since the asphalt wearing surface absorbs most of the shock or impact, the thickness of the concrete base proper, under normal conditions, need not average over six inches. It is proposed to use a 1-2-4 mix and a future crack in the area of the base or recess will not be seriously objectionable, since the asphalt surface completely covers and seals this area.

An asphaltic concrete can be substituted for the sheet asphalt surface, but the standard asphalt top is considered more efficient under modern traffic.

The roadway may be constructed one-half at a time, as shown in Fig. 3. This permits rapid construction and the use of either half of the road while the other half is being built. Fig. 4 shows the method of constructing one-half of the road on one side of the center line with the idea of completing the road at some future time. (Fig. 5.) Where funds are limited and prices are high and length of road is more important than width, this plan is recommended. The other half can be graded for use as a dirt road until funds are on hand or traffic required the building of the other half.

The curb-shoulders perform many useful things. They act as curbs to hold the resilient asphalt wearing surface in place and prevent the lateral displacement so often observed where curbs are not used. They assist materially in keeping the middle portion of the road in a dry state and thus reduce the danger of cracking and settlement within the area of maximum traffic. The curb-shoulders safely accommodate the infrequent or "turn-out" traffic, permit "parking" or repairing vehicles without interference with moving traffic. The full width of 28 feet of effective roadway will accommodate an emergency increase of traffic to three lines of moving vehicles.

The curb-shoulders, while relatively weaker than the selected wearing surface along the middle area of the roadway, are subjected to considerably less wear than the more comfortable and durable wearing surface, and should equal if not outlast the wearing surface proper.

Traffic tends to ride along the middle portion of the road because of the more comfortable (vertical) position of the vehicle, greater safety and usually cleaner conditions. After a light snowfall one may observe how little traffic uses other than the middle strip of roadway. To accommodate the traffic and induce it to spread over the roadway, the middle 20 feet should have a light crown. (See Fig. 2.)

The curb-shoulders are given an increased slope to facilitate drainage and to discourage use by fast moving traffic.

The recess between the curb-shoulders is easily formed and affords a convenient means of properly curing the concrete base, since the curb-shoulders act as a container to hold water. The curb-shoulders are built integral with the base and being of durable material obviate the necessity of building and maintaining inferior shoulders of earth or gravel, as is now the custom. The old type of shoulder absorbs water and permits it to percolate under the slab, whereas the concrete shoulder keeps the area under the middle or heavy traction portion of the roadway comparatively dry.

In Fig. 5, the pavement is shown with a curb even with the asphalt surface for a width of two feet along the center line of the road. This is advantageous and not a defect. The traffic ordinarily will straddle this strip, and where the traffic is heavy the strip will operate to keep the traffic separate and in two lines, thus using the full width of the road. The center strip of concrete, because of its thickness, will withstand all cross traffic. The formed joint along the outer line dividing the two halves of the pavement, being vertical and in a true line, will require little or no maintenance.

This design, then, is a combination pavement devised to use suitable materials to their best advantage. The resilient asphalt surface located along the area of maximum traffic absorbs impact, is waterproof, is easy on the eyes, gives low traction, is easy to repair or replace, and easy to clean. The curb shoulders, being white in color, add to safety of travel at night, and are of ample strength to accommodate the occasional traffic using them. It is confidently believed that this adaptation of a time-tested city pavement to road or highway use will prove to be more efficient, economical and durable as a paved surface, and more safe and comfortable to the traffic using it, than other types now in use.

### Ten Years of the Chicago Plan Commission

The Chicago Plan Commission, on the tenth anniversary of its creation, has issued a resume of the accomplishments of a decade, during which time it contributed so much to making Chicago a clean, beautiful and well developed metropolis.

Twelve basic features of its program are enumerated which are either under construction or advanced in procedure, either in the Board of Local Improvements or in the courts. They are: The Roosevelt road, widening and extension; the Michigan avenue, widening and extension; the west side passenger and freight terminal plans; the south shore lake front plans; the Illinois Central terminal rehabilitation; the widening of Western avenue; the widening and opening of Ashland avenue and Robey street; the South Water street widening and two-level connection with Michigan avenue; the acquisition of 14,254 acres of forest preserves by the Forest Preserve Commission; the improvement of the outer highway system.

Toward the cost of these improvements the people have voted \$61,510,000 in bonds. Special as-

sessments for Michigan avenue and Roosevelt road improvements have amounted to \$8,125,239.89. The railway companies have agreed to spend \$162,091,350 and the Forest Reserve Commission has expended \$5,316,762.

Barring unforeseen events, all these projects should be completed during the next five years excepting the electrification of the Illinois Central and the extension of the lake front park plans south of 39th street.

The value of city planning is shown by the great increase in building construction in the improved zones, as on Michigan avenue and Roosevelt road. The same results may be expected from all other public improvements. The effect on the commerce and prosperity of the city will be most stimulating.

At a recent meeting of the county commissioners and auditors of the State of Minnesota at Minneapolis, the plan of C. M. Babcock, state highway commissioner, for road construction was almost unanimously approved. An attempt was made to pass a resolution substituting gravel for the proposed hard-surface roads, but the opinion prevailed that hard roads, by lasting much longer, would be cheaper in the end.

### Oil Belt Power Company's Plant

Work has been commenced near Eastland, Texas, on the Leon River, just below the junction of its north and south forks, of a \$2,000,000 power plant for the Oil Belt Power Company, which intends to distribute electricity through the oil fields for drilling, pumping and other purposes. The plant will cost about \$2,000,000 and will include a concrete dam 25 feet high and 600 feet long impounding 1,600 acre-feet for boiler operation and cooling purposes. The power plant will be equipped with two 3,000 kilowatt steam turbines and boilers and will have a capacity of 8,000 h. p. Four miles of service track are being laid to the site of the plant for the delivery of materials and supplies from the Texas & Pacific Railroad. 500 men are required for the construction work.

### Ouray Reservoir Opposed by Utah

Simon Banberger, Governor of Utah, has appointed a delegation to attend the convention this month in Los Angeles of the League of the Southwest to oppose the construction of the Ouray Reservoir that would submerge two Utah towns and thousands of acres of fertile land to save the Imperial Valley, California, from flood damages, objects which it is claimed could be equally well accomplished by the construction of numerous small reservoirs on the head waters of tributaries to the Colorado River.

### Labor Efficiency Improving

The carefully classified unit costs on construction work that are kept by the Aberthaw Company, Boston, indicate that carpenters, masons, painters, and glaziers appear to be turning out as much work per hour as before the war. The 48-hour week, even with overtime does not turn out as much work as the old 54-hour week. Some satisfaction is expressed that the men are actually busy during working hours.

# Recent Legal Decisions

## EXTRA WORK CLAIM NOT ALLOWED.

(Pa.) Where contract for construction of city reservoir provided a certain payment for rock excavation, and assumed that enough would be excavated to make facings and riprap for inner slope, for which contract fixed a certain price, it was insufficient, and contractor was required to blast rock elsewhere at additional expense, the city's contention that work was covered by the extra work clause, defining extra work or material as that for which no definite unit price was fixed in contract, was correct, and contractor had no right to abandon work because city refused to accept his construction that he was entitled therefore to price of rock excavation.—*McKallip v. City of Altoona*, 108 A. 408.

## WAIVER OF ANNULMENT LIMITED.

(Pa.) Where a city waived its option to rescind or annul a contract for construction of a reservoir, because it was not completed within time limited, it did not thereby deprive itself of future right to annul or suspend contract for unsatisfactory work, and where contractor refused to do certain required parts of work it was not stopped from declaring a forfeiture, annulment, or suspension for sufficient cause other than the time of completion.—*McKallip v. City of Altoona*, 108 A. 408.

## RETAINED PERCENTAGE NOT ALLOWED ON ACCOUNT OF DEFECTIVE PLANS.

(Or.) Where the work of a contractor to build a reservoir and waterworks system for a city was well done and in substantial compliance with its contract, and any unsatisfactoriness in the result was from a defective design, selected by the water commission, rather than from any fault of the contractor, the contractor can recover a retained portion of the price of the work, accepted by the water commission on recommendation of its engineer as required by the contract.—*Oregon Engineering & Construction Co. v. City of West Linn*, 185 P. 750.

## SMALL UNFINISHED ITEM MAY PREVENT "SUBSTANTIAL PERFORMANCE."

(Pa.) Where a city reservoir was not completed until the facing and riprap on the slopes were in place, until which time even a small part of the reservoir might not be used, the doctrine of substantial performance had no place, in assumpsit to recover balance alleged to be due by contractor, who refused to complete contract.—*McKallip v. City of Altoona*, 108 A. 408.

## INTEREST DUE ON RECOVERED PAYMENT.

(Or.) Where the contractor to build a city's water system and reservoir received its compensation in municipal bonds in advance, the city, when sued to recover a deficiency in payments, is entitled to a credit on any recovery for interest accruing on the bonds during the time for which they were paid in advance as money advanced to the contractor for the purchase of materials.—*Oregon Engineering & Construction Co. v. City of West Linn*, 185 P. 750.

## RETAINED PERCENTAGE.

(Pa.) Where a contract of suretyship for performance of a municipal contract provided that on principal's default all moneys due him from city should become payable to surety, the principal, suing in assumpsit against city for balance alleged to be due, could not claim the retained percentage on ground that surety might never collect it.—*McKallip v. City of Altoona*, 108 A. 408.

Where retained percentage on city construction contract was by terms of contract of suretyship assigned to surety, and it was bound to collect it, less any claim of city against it, its failure to collect it after proper notice would make it liable to an accounting for net balance due by the city and for any balance due on last estimate paid to surety.

## REFEREEE CANNOT OVERTHROW HIS OWN DIRECTIONS.

(Or.) In an action against a city to recover the price for constructing a reservoir and water system, in view of the contract, making the city's engineer the referee to determine the amount, quality, and fitness of work, and evidence showing that deviations from the contract by the contractor were at the instance of the engineer, *held*, that evidence supports court's finding for plaintiff contractor, despite deviations from the contract not authorized in writing by the engineer as required.—*Oregon Engineering & Construction Co. v. City of West Linn*, 185 P. 750.

## ORAL EVIDENCE ACCEPTED.

(Mich.) Contract of plaintiff subcontractor *held* uncertain as to whether it covered certain excavating which contractor had agreed to do under his contract with city for installation of a water main, so that court properly received oral evidence tending to show intent of parties with reference thereto, and submitted to jury question whether work in dispute was intended to be included in plaintiff's contract.—*People v. Boyes*, 175 N. W. 289.

## CAN ACT TO RECOVER CONDITIONALLY SOLD PROPERTY WITHOUT FILING CLAIM FOR PRICE.

(Wash.) Where the contractor with a city to equip a power plant conditionally purchased machinery and equipment which was installed in the plant, the seller of the equipment could maintain action against the city for recovery of the equipment and enforcement of its reserved rights without filing claim for the balance due on the purchase price in compliance with Rem. Code 1915, § 7998.—*Allis-Chalmers Mfg. Co. v. City of Ellensburg*, 185 P. 811.

The seller of machinery and power plant equipment to the contractor to install such equipment in a city's plant had the right to enter into a conditional sale contract retaining title to the equipment until the price was fully paid, and such contract was as valid and binding against the city, it having been actually given notice thereof before receiving any of the equipment, as if the city were a private individual, to whose contracts Rem. Code 1915, §§ 1159, 1160, had no application.—*Id.*



## NEWS OF THE SOCIETIES

**April 27-29.—CHAMBER OF COMMERCE OF THE UNITED STATES.** Eighth annual meeting, Atlantic City.

**May 4-6.—NATIONAL FIRE PROTECTION ASSOCIATION;** Chicago. Secretary, 87 Milk street, Boston.

**May 10-11.—AMERICAN ASSOCIATION OF ENGINEERS.** Sixth Annual Convention, St. Louis, Mo. Secretary, C. E. Drayer, 63 East Adams Street, Chicago.

**May 13-14-15.—LEAGUE OF TEXAS MUNICIPALITIES.** The eighth annual convention will be held at Dallas, Tex. Secretary-Treasurer, Frank M. Stewart, University of Texas, Austin, Texas.

**May 18-21.—NATIONAL ELECTRIC LIGHT ASSOCIATION.** Annual convention, Pasadena, Cal. Acting Secretary, S. A. Sewall, 29 West 39th Street, New York City.

**June 21-25.—AMERICAN WATER WORKS ASSOCIATION.** Annual meeting, Montreal, Canada. Secretary, John M. Diven, 153 West 71st Street, New York City.

**June 22-25.—AMERICAN SOCIETY FOR TESTING MATERIALS;** Asbury Park, N. J. Office of secretary, Philadelphia.

**June 22.** JOINT COMMITTEE ON STANDARD SPECIFICATIONS FOR CONCRETE AND REINFORCED CONCRETE. Next meeting at Asbury Park. Secretary-treasurer, D. A. Abrams, Lewis Institute, Chicago.

**Aug. 30-Sept. 3.—AMERICAN PUBLIC HEALTH ASSOCIATION;** San Francisco. Office of secretary, Boston.

**Oct. 4-8.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS.** Annual convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Avenue, Valparaiso, Ind.

### The American Concrete Pipe Association.

This association has recently been reorganized and will open an office in Chicago with sufficient help to carry on its broadened activities. J. W. Lowell, Eastern Manager of the Service Bureau of the Universal Portland Cement Co., beginning April 1, will assume the duties of assistant manager of the same department at its headquarters in Chicago.

### The Material Handling Machinery Manufacturers Association.

At the directors meeting, April 6, The Material Handling Machinery Manufacturers Association of New York elected, president, Charles F. Lang (Pres. Lakewood Engineering Co., Cleveland).

#### BOARD OF GOVERNORS.

Vice President, Rumsey W. Scott (Otis Elevator Co., New York); treasurer, Lucian C. Brown (general sales agent, Elwell Parker Elec. Co., New York); secretary and manager, Zenas W. Carter (New York City, N. Y.); a board of governors and an executive committee.

The Association representation according to industries is as follows:

Cranes, hoists and winches, Hall and Standart; gravity and power conveyors, Walter and Merrill; elevators, Scott and Jenkins; industrial trucks and tractors, Brown and Owens; bulk handling machinery, Stadelman and Robins; miscellaneous equipment, Helmstaedter and Miller.

Additional companies elected to active membership were: Whiting Foundry and Equipment Co., Harvey, Ill., E. H. Bourne; Motors Terminal Co., Cleveland, Ohio, B. F. Fitch; C. W. Hunt Co., Inc., West New Brighton, New York, S. S. Hathaway.

The information presented at this meeting indicates that every division of the material handling machinery field is being pressed for deliveries of machines and equipment.

### American Association of Engineers.

Tentative program for fifth annual convention, Planters Hotel, St. Louis:

May 10, morning, routine business. Shall a Special Charge for Special Service be Made by the Employment Department?

Reports of Special Committees, Education, Ethics, Finance, Legislation, Membership, Salaries of Engineers in Public Service, Subcommittee on Salaries of Engineers in Municipal Service, Committee on Salaries of Engineers in Teaching Service.

A Permanent Home for A. A. E.

Afternoon—Getting Pay Schedules into Budgets for the Public Service Engineer.

What Part Shall A. A. E. take in the Presidential Campaign?

Americanization and Man-Power Engineering.

Making the Chapter a Force in the Community; Getting all Engineers into A. A. E.; Publicity for the Chapter; Program; Miscellaneous Activities.

The Federal Department of A. A. E. at Washington.

Opportunities for the Engineer in Civil, Structural, Mechanical, Mining and Chemical Fields.

Coordinating A. A. E. Activities in the State.

Reorganization of A. A. E. on a Business Basis.

Evening — Group Meetings; Draftsmen, Federal, Highway, Industrial and Chemical, Mining, Municipal, Railroad.

Tuesday, May 11, Morning—Business.

Afternoon—Unity of the Engineering Profession in the United States; American Red Cross; Seeing St. Louis.

Evening—Annual dinner; A. A. E. Principles; The Year Ahead; Reading by the Authors of Original Poems Dedicated to A. A. E.

The American Association of Engineers has concurred with the other groups of subordinate officials established by the recent order of the Interstate Commerce Commission, and has nominated W. F. Milligan and W. J. Potts for members of the Railway Labor Board provided by the Transportation Act of 1920.

The University of South Dakota Chapter of the A. A. E. has elected the following officers: H. Edison Fowler, president; Julian Pederson, vice-president; Benjamin N. Bowers, secretary, and C. Harold Flocken, treasurer.

The Huntington (West Virginia) Chapter of A. A. E. has elected the following officers: L. T. Nuckolls, president; B. V. Davis, first vice-president; H. L. Vandament, secretary, and H. H. Gwathmey, treasurer.

The University of Missouri Chapter has elected J. W. Moody, president, and W. W. Gorth, secretary. J. W. Sylvester, Grover Godwin, W. M. Galligan and Professor Guy B. Newton are directors. Dean E. J. McCaustland is faculty representative.

The Spokane Chapter was organized on April 3. E. C. Scharf acted as chairman and V. W. Gamble as secretary.

The Denver Chapter was organized on April 6. A. Lincoln Fellows, senior irrigation engineer of the division of irrigation investigations, office of public roads, was elected temporary chairman and H. B. Hunt, engineer with the United States Reclamation Service, temporary secretary.

The association has granted chapter charters to members in St. Augustine, Fla., and a club charter to members petitioning from McGehee, Ark.

The A. A. E. has granted chapter charters at Gary, W. Va., Clifton-Morenci, Ariz.; Rochester, N. Y.; Huntington, W. V.; and the Missouri School of Mines. Club certificates have been conferred at Jefferson City, Mo.; Effingham, Ill., and Burrwood, La.

The membership of the A. A. E. at the close of business on March 31 was 15,104. Almost three times as many applications were received this March as in the corresponding month last year.

The Kansas State College Chapter elected the following officers for 1920; Walter E. Dickerson, president; C. H. Scholer, vice-president; H. Kenneth Shideler, recording secretary; M. W. Furr, corresponding secretary; and Paul G. Martin, treasurer.

#### Brooklyn Engineers' Club.

At the regular meeting April 15, a paper was presented by Milton H. Freeman, on "Stopping of Leaks in the B. R. T. Subway, at the B'way-Canal St. Station." The paper was illustrated by lantern slides and discussed the arrangement of station and general method of construction; source of leakage; plant for grouting; grouting stairways under Centre street; grouting between the lower structure and the I. R. T. Subway; (a) setting grout pipes; (b) regulation of mixture and grouting pressures; (c) condition of joint when grouting stops; (d) grouting seepage cracks; (e) re-grouting; quantity of cement—time required to do the work; relation of grouting to the station waterproofing; effect of temperature changes upon grouted joints, and grout as a means of making overhead seal.

#### PERSONALS.

Brindle, T. S., has been appointed chief engineer, Ohio State Highway Department.

Breed, Eltinge H., recently first deputy highway commissioner of New York State, has been put in charge of highway engineering at the school of applied science, New York University.

Lenhart, L. G., has been appointed city engineer, Pontiac, Mich.

Grupe, George, has been appointed city manager of Brownsville, Texas.

McComb, D. Q., has been appointed division engineer, Tenn. Highway Department.

Ragland, Capt. R. F., has opened a general engineering and contracting office at Livingston, Montana.

McCourt, Prof. W. E., has been appointed dean of the school of the engineering and architecture of Washington University.

Elwell, A. T., has opened an office at 61 Broadway, New York, as consulting engineer on South American engineering projects.

Dawson, Shelton, has been appointed city engineer of Charles City, Ia.

Hurd, J. T., has been appointed city engineer, Eau Claire, Wis.

Jowers, G. M., has been appointed city engineer of Berde County, Texas.

Buck, R. J., has been appointed city engineer, Muskegon, Mich.

Bastable, F. J., assistant superintendent Department of Public Works, Rochester, N. Y., died February 19.

#### INDUSTRIAL NOTES.

##### Emanuel Slag Company.

H. C. Pastorius, for twenty years connected with the Central Railroad of New Jersey and having wide experience in the slag business, has accepted a position with the Emanuel Slag Company. He will handle the sales and traffic of this fast growing company. Their crushers are located at Catasauqua and Glendon, Pa., with their main office at 719 Hamilton street, Allenton, Pa.

##### Wallace & Tiernan Co., Inc.

Wallace & Tiernan Co., Inc., manufacturers of chlorine control apparatus for water and sewage purification and industrial uses, announce that Mr. Harold S. Hutton has been appointed district sales representative with headquarters in the Commonwealth Building, Pittsburgh, Pa. Mr. Hutton is a sanitary engineer who has previously been connected with the public health service and succeeds Mr. P. O. Collins, who is given indefinite leave of absence on account of illness.

##### Reliable Oxwelded Tank.

Out of the debris of a \$400,000 fire that swept two blocks of Tampa's industrial district last December practically the only salvage was a 12,000-gallon oxwelded oil storage tank, which was afterwards found intact excepting for dents and scars that were later removed. Inspection showed that the oxwelded seams held tight at every point, no leak developing anywhere in the welds.

The tank contained 5,000 gallons of gasoline at the time of the fire. When the platform supporting it was consumed the tank fell to the ground smashing a 5-inch outlet pipe. Roofing, beams and framework fell in and burned on top of the tank. Also a brick wall of an adjacent building collapsed, hurling tons of the brick on the conical top of the tank and bending the cone head below the level of the top tank ring. The tank was located approximately in the center of the burned area.

This example of the strength and endurance of oxwelding is noteworthy because the unusual shocks and strains to which the tank was subjected and because the tank itself is typical of oxwelded structures of the kind. The specifications of the tank had a diameter 16 feet, depth 11 feet, including the 2½-foot cone head, and was made of 10, 12 and 14 gauge iron.

The tank was built by the American Welding & Tank Company, of Tampa, Fla., and was constructed on

the premises, where only a 2-foot clearance was allowed, making the work unusually difficult. The tank is in service today, as good as the day it was finished.

##### New York City Branch of the Four Wheel Drive Auto Company.

J. H. Thompson has been appointed manager of the recently established factory branch at New York City, of the Four Wheel Drive Auto Company, Clintonville, Wis., makers of FWD trucks. The new branch covers a territory from Baltimore to New England.

Mr. Thompson started in the automobile game with the Babcock Electric Carriage Company at Buffalo, where he was for a number of years manager and territorial agent. He has later been connected with the sales organization of the General Motors Company and the Mercury Manufacturing Company.

##### Vacuum Steel Cleaners.

A patented vacuum street cleaner will soon be placed on the market by the reorganized C. B. Street Cleaner Company, Columbus, Ohio. The machine is designed to eliminate dust and to replace 5 teams of horses and their drivers, 4 men with push brooms and 4 men to shovel the dirt into wagons that are required by the ordinary hand process.

#### PROBLEMS CITIES ARE STUDYING WITH EXPERTS.

The public works commissioner of Detroit was appointed a commission to devise for the construction of the \$7,000,000 SEWER SYSTEM a plan that will afford protection from the fluctuation of prices of labor and materials and encourage the contractors who refuse to bid on the work under present conditions and requirements.

According to J. R. Hendry, city sewer engineer, many of the contracts let a year ago at what was considered a fair price are now being carried out at a loss to the contractors, due to advances in labor and material costs.

The commission consists of W. S. Kinmear, consulting engineer, W. F. Hoad, University of Michigan engineering department, John Mercier and George Cook, contractors and members of the city engineering corps, are collecting data on material costs which will be used as the basis of their recommendations.

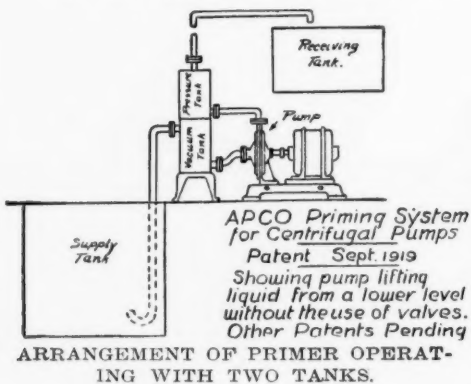
Erie, Pa., has plans for a \$667,500 INTERCEPTING SEWER disposal system. Chester & Fleming, consulting engineers.

# New Appliances

## The Apco Primer.

The Apco Primer manufactured by the Automatic Primer Company is a useful adjunct for centrifugal pumps that is adapted to any condition where any kind of valveless pump is used and it is necessary to maintain a vacuum on a suction line. After once being primed, the pump is always ready to start without danger of failure to function.

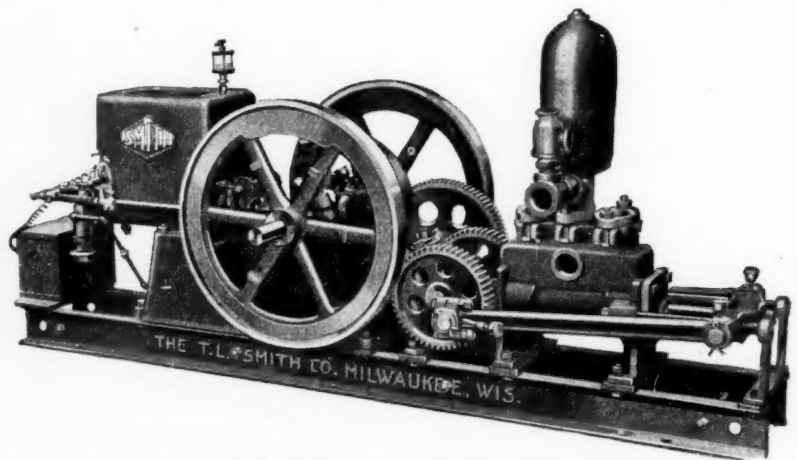
This system requires the installation of two tanks, one placed above the other and each having a capacity approximately  $\frac{1}{3}$  greater than the volume of air or gas in the suction line when expanded to the vacuum of the operation. The lower tank



or the lower division of a double tank is filled nearly full of liquid and the pump being started lowers the level of the liquid producing a partial vacuum and starting the liquid to flow through the suction line. While pumping, the upper tank or upper portion of double tank is always filled with liquid which, when pumping ceases, returns by gravity to the lower tank forcing the air back to the suction, flushing the suction line and repriming the system. The size and type of the Primer is governed by head against which the pump works, total length of suction line, diameter of suction line, and maximum vertical suction lift.

### Book for Pump Users.

Contractors and road builders will find the pamphlet, *Never Failing Water*, sent free by the T. L. Smith Company, interesting because it contains pump statistics on uses in connection with paving machinery. It shows by example how to figure the size of a pump necessary to supply a certain gallonage of water from any specified distance. It shows the friction loss developed by the passage of water through pipes



DOUBLE ACTING HIGH PRESSURE FORCE PUMP WITH DOUBLE TRAIN OF GEARS.

of various sizes. It has a set of statistics showing the amount of friction contributed by pipe fittings such as elbows, bends, valves, etc. Handy charts show at a glance the quality of water contained in rectangular or circular tanks of various dimensions. In addition it gives some very valuable operating hints which will enable the user to get more efficiency out of his pumping outfit.

The book tells, too, about the complete line of Smith pumps, which includes force, diaphragm and cen-

trifugal outfits of various sizes. The principle of extreme simplicity on which they are constructed gives fewer working parts, and the design of the pump is such that any part can be removed without dismantling other parts.

The Smith high pressure force pump is the only double acting force pump with a double train of gears which has the jack bearing cast integral with the pump to insure perfect and permanent alignment of the shafts and cross head pinions.

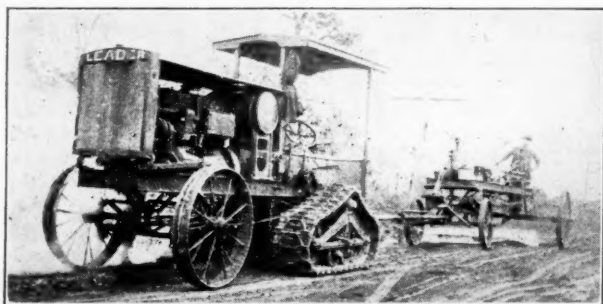
### Leader Crawler Tractors.

These tractors are recommended by the Dayton-Down Company for road work on account of their great power, light weight, durability and flexibility. They are made in two sizes and burn from 18 to 30 gallons of kerosene oil daily. They are built with two light smooth face front wheels and are mounted in the rear on a four-wheel truck with caterpillar traction and Hyatt roller bearings. They have a forward and reverse speed of 2 miles and a high speed of  $3\frac{1}{4}$  miles per hour; transmission is of the automobile selective type with sliding gear. All

gears are of cut steel and the heavy channel bar frame is heavily braced and trussed. Both sizes have a 98-inch wheel base and a shipping weight of 6,200 pounds or 6,500 pounds.

### Smith Simplex Paving Mixers.

The T. L. Smith company has issued a new booklet describing the paving mixer that has been designed to solve just these problems. The Smith Simplex frame is twelve times as strong as the ordinary single channel frame.



CRAWLER TRACTOR HAULING ROAD MACHINE.